



July 30, 2018

Claudia Young Smith
Air Program, Mail Code 8P-AR
US Environmental Protection Agency Region 8
1595 Wynkoop Street
Denver, Colorado 80202

RE: FBIR Compressor Station Tribal NSR Synthetic Minor Permit Application

Dear Ms. Smith,

Van Hook Gathering Services, LLC (VHGS), is submitting the enclosed Tribal New Source Review (NSR) Synthetic Minor Permit Application for the FBIR Compressor Station (Facility) located in Mountrail County, North Dakota. The Facility is a new natural gas compressor station regulated under the Fort Berthold Indian Reservation (FBIR) Federal Implementation Plan (FIP). The facility is owned by VHGS but will be operated by MCP Operating LLC.

The facility will have an uncontrolled potential to emit (PTE) for regulated air pollutants above the major source thresholds as defined in 40 CFR §49.167 and §52.21. As such, VHGS submits this application for a synthetic minor source permit in accordance with 40 CFR §49.158 to emit regulated air pollutants and establish federally enforceable limits at the Facility pursuant to 40 CFR §49.153(a)(3). With the issuance of the requested federally enforceable limits, the Facility will not exceed the proposed allowable emissions for criteria air pollutants. Therefore, the Facility's emissions will not be at or above the major source Prevention of Significant Deterioration (PSD) thresholds as defined in 40 CFR §52.21(b)(1). The facility is a minor source with respect the Federal Operating Permits Program (Title V) as defined in 40 CFR §71.2 Subpart A.

Enclosed with this letter are the forms SYNMIN and NEW, and all applicable components required for the Tribal NSR Synthetic Minor Limit Application.

If you have any questions regarding this submittal, please feel free to contact me at loren.fuller@mcpoperating.com or at 713-457-8307.

Sincerely,

A handwritten signature in black ink, appearing to read "Loren Fuller".

Loren Fuller
Project Manager
Van Hook Gathering Services, LLC

Enclosure:

cc: Three Affiliated Tribes Environmental Division

Prepared for:

Van Hook Gathering Services, LLC

Submitted to:

**US Environmental Protection Agency Region 8
Air Program**

Prepared by:

Ramboll US Corporation

Date:

July 2018

Project Number:

1690009067

FEDERAL NEW SOURCE REVIEW APPLICATION FOR SYNTHETIC MINOR SOURCE PERMIT

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ACRONYMS AND ABBREVIATIONS

40 CFR	Title 40 of the United States Code of Federal Regulations
AFRC	Air Fuel Ratio Controller
AOS	Alternative Operating Scenario
AP-42	EPA's AP-42, Compilation of Air Pollutant Emission Factors, Fifth Edition
AQRV	Air Quality Related Value
bbl	Barrel
BRE	Bryan Research & Engineering
CH ₄	Methane
CO	Carbon Monoxide
CO ₂ e	Carbon Dioxide Equivalent
DRE	Destruction and Removal Efficiency
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
FBIR	Fort Berthold Indian Reservation
FIP	Federal Implementation Plan
GHG	Greenhouse Gas
GPM	Gallons per Minute
GWP	Global Warming Potential
H ₂ S	Hydrogen Sulfide
HAP	Hazardous Air Pollutant
Hp	Horsepower
Ib	Pound
Ib-mol	Pound-Mole
MACT	Maximum Achievable Control Technology
VHGS	VHGS Operating
Mg/yr	Megatons per year
MMscfd	Million Standard Cubic Feet Per Day
MMscf/yr	Million Standard Cubic Feet Per year
MSCF	Thousand Standard Cubic Feet per Year
MSS	Maintenance, Startup, and Shutdown
N ₂ O	Nitrous Oxide
NAAQS	National Ambient Air Quality Standard
NAIC	North American Industrial Classification System
NESHAP	National Emission Standards for Hazardous Air Pollutants
NHPA	National Historic Preservation Act
NO _x	Oxides of Nitrogen
NSPS	New Source Performance Standards

ACRONYMS AND ABBREVIATIONS (CONT'D)

NSR	New Source Review
ppmv	Parts per Million by Volume
PSD	Federal Clean Air Act, Part C
psia	Pounds per Square Inch (absolute)
psig	Pounds per Square Inch (gauge)
PTE	Potential To Emit
RICE	Reciprocating Internal Combustion Engines
RVP	Reid Vapor Pressure
Scf	Standard Cubic Feet
SIC	Standard Industrial Classification
SO2	Sulfur Dioxide
TEG	Triethylene Glycol
tpy	Tons per Year
VOC	Volatile Organic Compound

1. INTRODUCTION

Van Hook Gathering Services, LLC (VHGS) proposes to construct a new natural gas compressor station on the Fort Berthold Indian Reservation (FBIR). The facility is owned by VHGS and will be operated by MCP Operating LLC. The proposed facility is located in Mountrail County, North Dakota which is attainment/unclassifiable for all criteria pollutants. The FBIR Compressor Station is located in the SENE Section 4, Township 150 North, Range 93 West within the Fort Berthold Indian Reservation (FBIR).

The Facility includes separator vessels, condensate storage tanks, fugitive emissions, loading, reciprocating internal combustion engines, triethylene glycol (TEG) dehydrator and planned maintenance, startup, and shutdown (MSS). The facility includes two (2) alternate operating scenarios (AOS) to account for upset conditions when the inlet gas is sent to the flare and when the vapors from the dehydrator flash tank and condenser are routed to the vapor combustor when the reboiler goes down. A summary of the equipment is listed in Table 2-1.

The Facility is a new natural gas compressor station regulated under the FBIR Federal Implementation Plan (FIP) under the permitting authority of the Environmental Protection Agency (EPA) Region 8 Federal Minor New Source Review Program in Indian Country under 40 CFR §49 Subpart K. The FBIR Compressor Station will have potential emissions below the registration thresholds in the Tribal NSR rule. The facility is a minor source with respect to both Prevention of Significant Deterioration (PSD) review as well as the Federal Operating Permits Program (Title V) as defined in 40 CFR §52.21(b)(1) and 40 CFR §71.2 Subpart A. As summarized in Table 3-1, the PTE, calculated as defined in 40 CFR §49.152 and 40 CFR §52.21(b)(1) for non-named sources, for each criteria pollutant is less than 250 tpy. Federal major new source review and prevention of significant deterioration (PSD) review are not triggered. Additionally, Title V permitting requirements will not be triggered since the Title V major source thresholds, as defined in 40 CFR §71.2, are not exceeded: 100 tpy for each criteria pollutant, 25 tpy for total hazardous air pollutants (HAPs), 10 tpy for any single HAP.

Enclosed are the required application materials consisting of the following: a process description, process flow diagram, emission calculations, laboratory analyses, NEW and SYNMIN forms and other documentation supporting the emissions estimates.

2. PROCESS DESCRIPTION AND PROCESS FLOW DIAGRAM

The FBIR Compressor Station is a midstream oil and gas facility used to compress gas from a field gathering line into a gas sales pipeline. The facility will operate 24 hours a day, 7 days a week, and 52 weeks a year, for total annual hours of 8,760. The facility is requesting to handle up to 22 million standard cubic feet per day (MMscfd) of natural gas and 140 barrels (bbls) per day of condensate. The facility will consist of initial separation equipment, compressor engines (C-1 to C-3), condensate storage tanks (TK-1 to TK-4), TEG dehydration unit (DHY-1) and associated reboiler (R-1), tank truck loading (TL-1), a vapor combustor (EC-1), an emergency flare (FL-1) and fugitives (FUG).

The FBIR Compressor Station will transport two-phase field gas from upstream wells through an inlet slug catcher where free liquids (condensate and water) will be removed. Natural gas will then pass through a suction header that will feed up to three compressor units, which boost gas pressure. The

gas is then dehydrated through a TEG dehydration unit equipped with a flash tank and condenser. The dehydrated gas will go through a 2-phase separator to knock out liquids before it's sent to a sales pipeline for transmission. Condensate and water will be stored in four 400-bbl tanks until transported from the site. Total fluids will be transported off-site by tank truck for sales. The condensate storage tanks will be equipped with a vapor combustor that will control the vapor working, breathing and flashing emissions.

The vapors from the TEG dehydrator regenerator are routed to a condenser. Under normal operating conditions the flash vapors from the TEG dehydrator flash tank and the non-condensable vapors from the condenser are routed to the reboiler (R-1) as fuel.

Three 1,775 horsepower (hp) natural gas-fired compressor engines will be used for sales gas compression. Each engine is a 4-stroke lean-burn Caterpillar G3606LE engines. Each engine is equipped with an air fuel ratio controller (AFRC) and an oxidation catalyst.

Produced gas is primarily sold through a sales pipeline. However, in the event of emergencies, gathering system problems, or equipment upsets, the gas is sent to an emergency flare.

Tank truck loading emissions occur at condensate tank battery during the loading of the tank trucks for sales. The condensate is submerge-filled as it is loaded into the truck. As the condensate is pumped into the truck, the fluid displaces the vapors. The displacement causes the vapors to vent from inside the truck. The tank truck vapors are controlled by a vapor combustor.

There are fugitive emissions associated with the piping connections, valves, and controllers. These emissions occur due to the potential leaking of connections, seats, and seals.

MSS emissions include routine compressor maintenance blowdown events. The compressor blowdowns will be controlled by the flare.

The process flow diagram is shown in Figure 2-1.

Table 2-1. Summary of Equipment

Equipment ID	Equipment Description	Capacity/Design Rate	Controls
FUG	Fugitives	N/A	None
C-1	Compressor Engine	1,775 hp	Oxidation Catalyst
C-2	Compressor Engine	1,775 hp	Oxidation Catalyst
C-3	Compressor Engine	1,775 hp	Oxidation Catalyst
TK-1	Condensate Storage Tank	400 bbl	EC-1
TK-2	Condensate Storage Tank	400 bbl	EC-1
TK-3	Condensate Storage Tank	400 bbl	EC-1
TK-4	Condensate Storage Tank	400 bbl	EC-1
DHY-1	TEG Dehy	22 MMscfd	EC-1
R-1	Reboiler	0.5 MMBtu/hr	None
TL-1	Condensate Loading	8,000 gal/hr	EC-1
FL-1	Emergency Flare	22 MMscfd	FL-1
EC-1	Vapor Combustor	35 Mscfd	EC-1
MSS-Blowdown	MSS Blowdowns	2,800 scf/event	FL-1

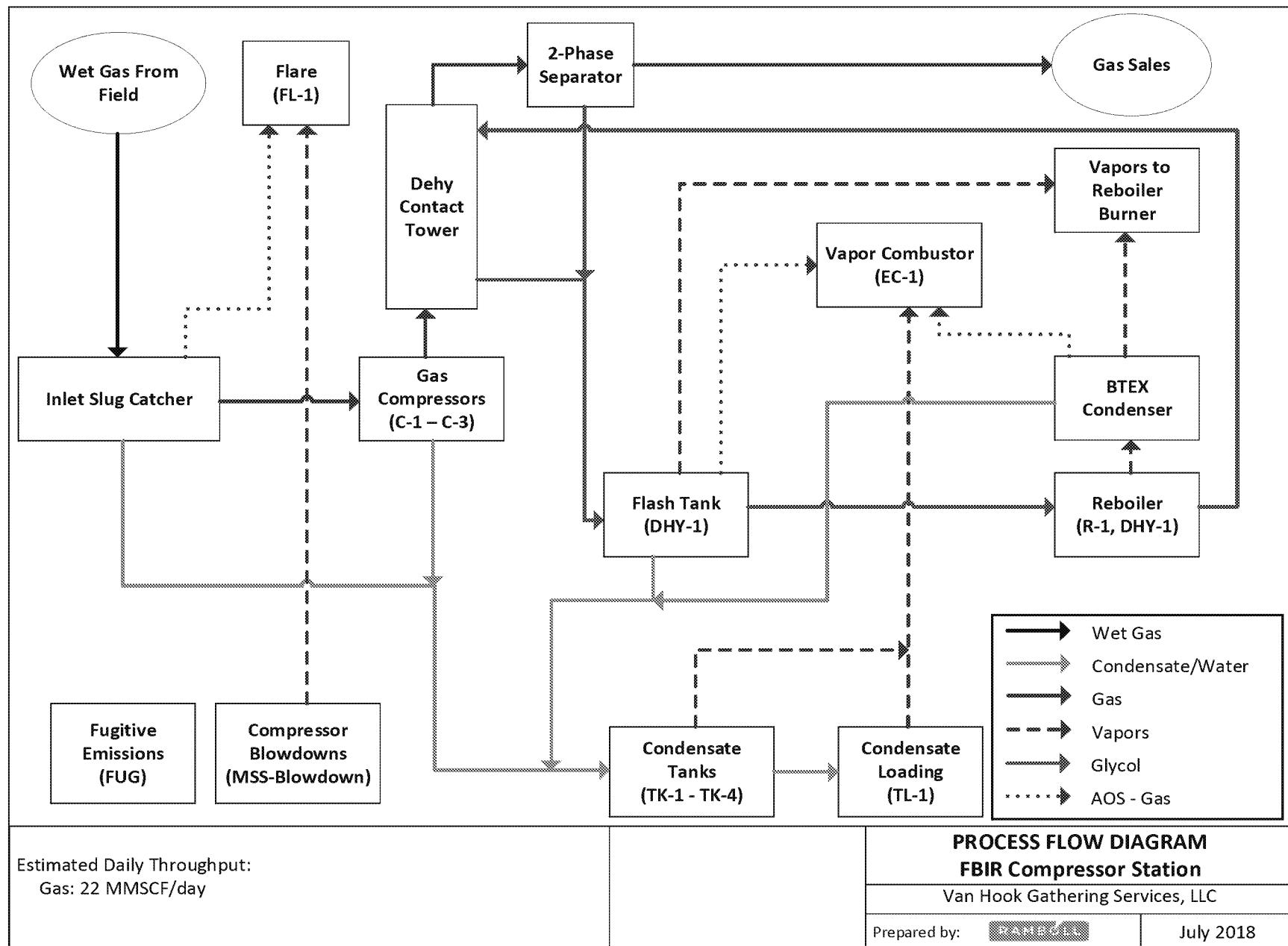


Figure 2-1. Process Flow Diagram

3. EMISSIONS SUMMARY

The maximum air pollutant emission rates proposed for the facility are presented in Table 3-1. The uncontrolled PTE Maximum Air Pollutant Emission Rates are presented in Table 3-2. Detailed emission calculations for the proposed equipment and operations are presented in Appendix A.

3.1 Emissions Calculations

Emissions of Volatile Organic Compounds (VOCs) from material phase change such as loading, flashing, and tank losses were calculated using the ProMax Process Simulator published by Bryan Research and Engineering (BRE). The process simulator calculation tables are provided in Appendix A.

3.1.1 Gas Analyses

The composition and physical properties of a natural gas sample is from a representative analysis. The laboratory analyses are provided in Appendix C.

3.1.2 Storage Tank Emissions

Emissions of VOCs and H₂S from the oil tanks (TK-1 and TK-4) were estimated using BRE ProMax process simulator. This model accounts for both flash emissions from the change in liquid stream pressure from upstream equipment to ambient conditions and the working/breathing losses. The emissions are based on the average daily production rate, design operating pressure and temperature of the slug catcher and compressors, and the material analyses as discussed in the previous section. Hourly tank flash and working/breathing emissions and annual tank working/breathing emissions are conservatively based on the maximum storage tank liquid surface temperature. Annual flash emissions are based on the average annual storage tank liquid surface temperature. Emissions from the storage tanks are routed to the vapor combustor (EC-1).

Greenhouse Gas (GHG) emissions from the storage tanks were calculated for carbon dioxide (CO₂) and methane (CH₄) from mass balances.

3.1.3 Condensate Loading Emissions

Emissions from truck loading (TL-1) of the condensate were estimated using the loading loss emission factor and maximum estimated loading rates. The loading losses emission factor is based on Equation 1 from EPA AP-42 Chapter 5.2 *Transportation and Marketing of Petroleum Liquids*, dated June 2008:

Where:

$$L_L = \frac{12.46 \cdot SPM}{T}$$

L_L = loading losses (lb/Mgal);

S = saturation factor (dimensionless);

P = true vapor pressure of the liquid loaded (psia);

M = vapor molecular weight (lb/lbmol); and

T = temperature of the liquid loaded (R).

The saturation factors are provided in EPA AP-42 Table 5.2-1. The saturation factor for the submerged loading of a dedicated normal service truck was used. True vapor pressure, P, was derived from the Reid Vapor Pressure (RVP) of oil using EPA AP-42, Figure 7.1-13A. The vapor molecular weight, M, as well as the temperature of the liquid loaded, T, RVP, and the VOC and HAP speciation are based on BRE ProMax process simulator calculations.

Fugitive loading losses are represented under TL-1. Captured and controlled emissions are controlled by the vapor combustor (EC-1). A 98.7% control capture is used assuming trucks passing New Source Performance Standards (NSPS) level annual leak tests, as stated in AP-42 5.2-6.

3.1.4 Internal Combustion Unit Emissions

Emissions from the compressor engines (C-1 to C-3) of VOCs, formaldehyde, nitrogen oxides (NO_x), and carbon monoxide (CO) were estimated using the engine and catalyst manufacturer specifications. VHGS is requesting the following federally enforceable limits to limit facility PTE:

- NO_x emissions at 1.5 g/hp-hr;
- CO emissions at 0.24 g/hp-hr; and
- VOC emissions at 0.5 g/hp-hr.

All other emission factors were taken from AP-42 Section 3.2 for the appropriate engine type (AP-42, Section 3.2, July 2000).

GHG emissions for the internal combustion engines were estimated using GHG factors from AP-42, Table 1.4.2 Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion.

3.1.5 External Combustion Unit Emissions

Emissions from the glycol reboiler (R-1) were estimated using emission factors from EPA AP-42 Chapter 1.4 *Natural Gas Combustion*, dated July 1998, for small boilers for all pollutants except sulfur dioxide (SO₂) and H₂S, the maximum design heat input rating, and annual hours of operation.

Emissions of SO₂ were calculated based on the maximum H₂S content of the gas, the maximum firing rate of the produced gas, and conservatively assuming 100% conversion to SO₂. Similarly, H₂S emissions were based on the maximum H₂S content of the gas and maximum firing rate of the produced gas and assuming 98% conversion to SO₂.

GHG emissions from the external combustion unit was estimated using GHG factors from AP-42, Table 1.4.2 *Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion*.

3.1.6 TEG Dehydrator Emissions

Emissions from the TEG dehydrator (DHY-1) were determined via BRE ProMax process simulator. This model predicts the amount of hydrocarbon vapor that is absorbed and subsequently emitted from the regenerator and flash tank. The emissions are based on the average daily production rates, design operating pressure and temperature of the glycol flash tank and regenerator, glycol circulation rate, and material analysis discussed in Section 3.1.1.

During normal operating conditions, emissions from the glycol flash tank are routed to the reboiler (R-1) as supplemental fuel gas. The overhead vapors from the glycol regenerator are controlled by a condenser, and vapors from the condenser are routed to the reboiler (R-1) fuel gas. If the condenser must be bypassed, flash tank vapors are routed to the vapor combustor (EC-1). PTE considers all flash tank vapors are sent to the vapor combustor.

3.1.7 Flare and Vapor Combustor Emissions

Emissions of CO and NO_x were calculated using emissions factors from AP-42 Table 13.5-1. Particulate matter, PM₁₀ and PM_{2.5}, emission factors are from AP-42, Table 1.4-1 and 1.4-2, July 1998. Sulfur dioxide (SO₂) emissions assume 100% conversion of H₂S to SO₂.

VOC and HAP emissions from the flare and vapor combustor are estimated using the *TCEQ Technical Guidance Package (RG-109) for Flares and Vapor Oxidizers*, dated October 2000, based on the maximum expected flow rate and heating value of each stream routed to the flare. The gas flow includes a pilot gas stream of sweet field gas. The maximum flow rates and heating values were

estimated using ProMax and are provided in Appendix A. Emissions factors and destruction and removal efficiencies (DRE) were used in accordance with the technical guidance for this type of air-assisted high Btu flare. The flare operates with a control efficiency of 99% for VOCs with one carbon atom (C1) to VOCs with three carbon atoms (C3) compounds and 98% for VOCs with four or more carbon atoms (C4+). The flare and combustor operate with an automatic ignition system to ensure these units are constantly available; however, emissions conservatively assume a constantly lit pilot.

GHG emissions from the flare and vapor combustor were calculated based on the gas heat input rates and the carbon dioxide (CO₂), Methane (CH₄), and nitrous oxide (N₂O) emission factors for fuel gas provided in 40 CFR Part 98 - Mandatory Greenhouse Gas Reporting, Subpart C, Tables C-1 and C-2. Equivalent carbon dioxide emissions (CO₂e) were estimated based on individual GHG emissions and the Global Warming Potentials (GWP) provided in 40 CFR Part 98, Subpart A, Table A-1.

3.1.8 Fugitive Emissions

Fugitive emissions (FUG) from equipment leaks are estimated using emission factors for oil and gas production facilities from the EPA's "Protocol for Equipment Leak Emission Estimates" November 1995, EPA 4531, R-95-017, Table 2-4. No control efficiency is applied to the emissions. Total fugitive component counts are based on default average component counts for major crude oil production equipment (40 CFR Part 98, Subpart W, Table W-1C) and major onshore natural gas production equipment (40 CFR Part 98, Subpart W, Table W-1B).

3.2 Alternate Operating Scenario (AOS)

The following AOS are included in the permit application for the facility.

3.2.1 Flare Emissions

The flare (FL-1) handles inlet gas during upset conditions (instances when the sales pipeline goes down) as an AOS. The volume of gas flared will not exceed 298.41 MMscf/yr.

Emissions are calculation as described in Section 3.1.7.

3.2.2 Vapor Combustor Emissions

During instances where vapors from the TEG dehydrator flash tank and BTEX condenser cannot be routed to the reboiler fuel gas, the vapors will be controlled by the vapor combustor (EC-1). This complies with the dehydration unit process vent standards of 40 CFR §63.765(b)(1)(i).

Emissions are calculated as described in Section 3.1.7. PTE assumes that all flash tank vapors are routed to the vapor combustor.

3.3 Maintenance, Startup and Shutdown (MSS) Emissions

In addition to the normal operation emission sources, VHGS is requesting to include the following planned MSS operations into the total annual emissions for the FBIR Compressor Station.

3.3.1 MSS – Compressor Blowdowns

Compressor blowdown emissions (MSS-Blowdowns) were estimated for the inlet gas compressors. Emissions are calculated using the ideal gas law to determine the mass of VOCs and HAPs vented to the atmosphere. Based on an estimate provided from the compressor vendor, it is assumed a total of 2,800 scf of produced gas per compressor is blown down for each event under normal operating conditions. The volume of gas blown down will not exceed an estimated 436.8 thousand standard cubic feet (Mscf) per year. The composition of the vented gas is based on a simulated inlet gas stream. The compressor blowdowns will be routed to the flare (FL-1).

Table 3-1. Proposed Actual Maximum Air Pollutant Emission Rates

Emission Source	Equipment ID	VOC		NO _x		CO		PM ₁₀		PM _{2.5}	
		lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy
Fugitives	FUG	3.05	13.37	--	--	--	--	--	--	--	--
Compressor Engine	C-1	2.47	10.80	5.87	25.71	0.94	4.11	0.12	0.53	0.12	0.53
Compressor Engine	C-2	2.47	10.80	5.87	25.71	0.94	4.11	0.12	0.53	0.12	0.53
Compressor Engine	C-3	2.47	10.80	5.87	25.71	0.94	4.11	0.12	0.53	0.12	0.53
Reboiler	R-1	0.01	0.02	0.10	0.44	0.09	0.37	0.01	0.03	0.01	0.03
Condensate Loading	TL-1	1.66	0.13	--	--	--	--	--	--	--	--
Flare	FL-1	372.58	59.80	94.05	15.10	511.74	82.17	10.31	1.65	10.31	1.65
Vapor Combustor	EC-1	4.25	5.63	0.59	0.72	3.20	3.91	0.06	0.08	0.06	0.08
TOTAL EMISSIONS		388.95	111.35	112.35	93.39	517.85	98.79	10.74	3.36	10.74	3.36
TOTAL EMISSIONS (Excluding Fugitives)		385.89	97.98	112.35	93.39	517.85	98.79	10.74	3.36	10.74	3.36

Table 3-1. Proposed Actual Maximum Air Pollutant Emission Rates (cont'd)

Emission Source	Equipment ID	SO ₂		H ₂ S		Benzene		Formaldehyde		HAP	
		lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy
Fugitives	FUG	--	--	--	--	2.32E-03	0.01	--	--	0.05	0.24
Compressor Engine	C-1	0.01	0.02	5.70E-05	2.50E-04	4.89E-03	0.02	0.51	2.23	0.74	3.26
Compressor Engine	C-2	0.01	0.02	5.70E-05	2.50E-04	4.89E-03	0.02	0.51	2.23	0.74	3.26
Compressor Engine	C-3	0.01	0.02	5.70E-05	2.50E-04	4.89E-03	0.02	0.51	2.23	0.74	3.26
Reboiler	R-1	6.09E-04	2.67E-03	1.56E-06	6.83E-06	2.13E-06	9.33E-06	7.61E-05	3.33E-04	1.92E-03	0.01
Condensate Loading	TL-1	--	--	--	--	1.45E-03	1.12E-04	--	--	0.06	4.30E-03
Flare	FL-1	--	--	--	--	0.48	0.08	--	--	10.74	1.72
Vapor Combustor	EC-1	--	--	--	--	0.01	0.01	--	--	0.19	0.20
TOTAL EMISSIONS		0.02	0.07	1.72E-04	7.56E-04	0.51	0.16	1.53	6.68	13.28	11.94
TOTAL EMISSIONS (Excluding Fugitives)		0.02	0.07	1.72E-04	7.56E-04	0.51	0.15	1.53	6.68	13.23	11.70

Table 3-2. Uncontrolled PTE Maximum Air Pollutant Emission Rates

Emission Source	Equipment ID	VOC		NO _x		CO		PM ₁₀		PM _{2.5}	
		lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy
Compressor Engine	C-1	2.47	10.80	5.87	25.71	0.94	4.11	0.12	0.53	0.12	0.53
Compressor Engine	C-2	2.47	10.80	5.87	25.71	0.94	4.11	0.12	0.53	0.12	0.53
Compressor Engine	C-3	2.47	10.80	5.87	25.71	0.94	4.11	0.12	0.53	0.12	0.53
Condensate Tank	TK-1	31.33	77.61	--	--	--	--	--	--	--	--
Condensate Tank	TK-2	31.33	77.61	--	--	--	--	--	--	--	--
Condensate Tank	TK-3	31.33	77.61	--	--	--	--	--	--	--	--
Condensate Tank	TK-4	31.33	77.61	--	--	--	--	--	--	--	--
TEG Dehydrator	DHY-1	8.70	38.11	--	--	--	--	--	--	--	--
Reboiler	R-1	0.01	0.02	0.10	0.44	0.09	0.37	0.01	0.03	0.01	0.03
Condensate Loading	TL-1	127.93	9.87	--	--	--	--	--	--	--	--
Flare	FL-1	372.58	1,625.37	94.05	410.57	511.74	2,233.99	10.31	44.99	10.31	44.99
MSS Blowdowns	MSS-Blowdown	94.92	7.40	--	--	--	--	--	--	--	--
TOTAL EMISSIONS (Excluding Fugitives):		736.87	2,023.63	111.76	488.14	514.65	2,246.70	10.68	46.61	10.68	46.61

Table 3-2. Uncontrolled PTE Maximum Air Pollutant Emission Rates (cont'd)

Emission Source	Equipment ID	SO ₂		H ₂ S		Benzene		Formaldehyde		HAP	
		lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy
Compressor Engine	C-1	0.01	0.02	5.70E-05	2.50E-04	4.89E-03	0.02	0.51	2.23	0.74	3.26
Compressor Engine	C-2	0.01	0.02	5.70E-05	2.50E-04	4.89E-03	0.02	0.51	2.23	0.74	3.26
Compressor Engine	C-3	0.01	0.02	5.70E-05	2.50E-04	4.89E-03	0.02	0.51	2.23	0.74	3.26
Condensate Tank	TK-1	--	--	--	--	0.06	0.10	--	--	1.34	2.27
Condensate Tank	TK-2	--	--	--	--	0.06	0.10	--	--	1.34	2.27
Condensate Tank	TK-3	--	--	--	--	0.06	0.10	--	--	1.34	2.27
Condensate Tank	TK-4	--	--	--	--	0.06	0.10	--	--	1.34	2.27
TEG Dehydrator	DHY-1	--	--	--	--	0.01	0.03	--	--	0.07	0.31
Reboiler	R-1	6.09E-04	2.67E-03	1.56E-06	6.83E-06	2.13E-06	9.33E-06	--	--	1.92E-03	0.01
Condensate Loading	TL-1	--	--	--	--	0.11	0.01	7.61E-05	3.33E-04	4.28	0.33
Flare	FL-1	--	--	--	--	0.48	2.10	--	--	10.74	46.72
MSS Blowdowns	MSS-Blowdown	--	--	--	--	0.18	0.01	--	--	3.90	0.30
TOTAL EMISSIONS (Excluding Fugitives):		0.02	0.07	1.72E-04	7.56E-04	1.02	2.62	1.53	6.68	26.58	66.52

4. COMPLIANCE WITH FEDERAL AND TRIBAL NSR SYNTHETIC MINOR PERMITTING REQUIREMENTS

A summary of compliance with applicable federal requirements, including applicable New Source Performance Standards (NSPS) regulations is provided in Tables 4-2. Information required in Section B. of the Tribal NSR Synthetic Minor application form (SYNMIN) is provided below

4.1 Tribal NSR Application Form Information

4.1.1 Item 1

VHGS is proposing to limit the PTE of the Facility emissions by limiting the annual natural gas throughput to 8,030 MMscf/yr (12-month rolling total) and the annual condensate throughput to 51,100 bbls of condensate per year (12-month rolling total).

The flares will operate with the DRE for VOC and H₂S emissions as described in Section 3.2.1. The flare will limit the site-wide PTE for VOC emissions from 2,023.63 tpy to 97.98 tpy, as shown in Table 3-1 and Table 3-2. These will serve as practically enforceable limits (as defined in 40 CFR §49.152) in order to establish PTE less than the major source threshold of criteria pollutants, as defined in 40 CFR §52.21. With the proposed federally enforceable limits on PTE, PSD requirements will not be triggered since the major source thresholds under 40 CFR §52.21 are not exceeded. Title V permitting requirements will not be triggered since the Title V major source thresholds, as defined in 40 CFR §71.2, are not exceeded: 100 tpy for each criteria pollutant, 25 tpy for total hazardous air pollutants (HAPs), 10 tpy for any single HAP.

4.1.2 Item 2

VHGS will demonstrate compliance with throughput limitations by recording the monthly production rates of condensate and produced gas. Gas routed to the flare during emergencies will be monitored with a quality-assured flow monitoring device. Compliance will be demonstrated by the 12-month rolling sum of the total rates. Both the flare and combustor (FL-1 and EC-1) will be designed to operate in compliance with 40 CFR §60.18 specifications. See Attachment A for 40 CFR §60.18 compliance demonstrations of the flare and combustor tip velocities. Attachment D include flare and combustor quotes received from flare vendors to date with specifications meeting 40 CFR §60.18.

VHGS will conduct monitoring procedures in accordance with NSPS OOOOa 40 CFR §60.5417a on the vapor combustor (EC-1) to confirm proper operation. In addition, VHGS will conduct monitoring on the vapor combustor to confirm proper operation:

- Continuous monitoring of the pilot flame using a temperature sensing device, and recording device that will indicate the continuous ignition of the pilot flame at all time when the device is operating;
- Check the recording device is in proper operation once per day;
- Check the auto-ignition system to ensure proper operation once per day;
- Check the pilot flame to ensure proper operation once per day; AND
- Correct any pilot flame and auto-ignition system failure, when notified by the malfunction alarm as soon as possible, but no longer than five (5) days from the day of the malfunction.

4.1.3 Item 3

VHGS proposes to operate an emergency flare and a condensate tank combustor with a DRE of 99% for C1 to C3, and 98% for C4+ emissions. The flare and combustor will have a manufacturer's guarantee of 98% DRE. Each flare/combustor will comply with the technical specifications of 40 CFR §60.18, as demonstrated in the flare compliance calculations in Appendix A. The flare and combustor will be equipped with an autoignition system to ensure the pilot flame is present at all times of operation. The combustor will be an OOOOa approved combustor.

VHGS will be requesting the following federally enforceable limits for the compressor engines:

- NOx emissions at 1.5 g/hp-hr;
- CO emissions at 0.24 g/hp-hr; and
- VOC emissions at 0.5 g/hp-hr.

Source testing will be conducted on the engines to demonstrate compliance with the federally enforceable limits.

4.1.4 Item 4

Emission estimates and calculation methodologies are discussed in Section 3 of this application, and detailed emission calculations are provided in Appendix A.

4.1.5 Item 5

Emissions of Greenhouse Gases (GHG) are presented in Table 4-1 and detailed calculations are provided in Appendix A.

4.2 Air Quality Review

The facility will be constructed in Mountrail County, North Dakota which is attainment/unclassifiable for all criteria air pollutants. VHGS is requesting a synthetic minor source permit to limit the PTE of regulated pollutants below major source threshold levels as specified in 40 CFR §52.21(b)(1). Therefore, major new source is not triggered and the requirements of 40 CFR §49.158 do not specify the need for air quality review. Therefore, preconstruction monitoring or analysis of impacts to NAAQS, PSD increments, or air quality related values (AQRV)s under 40 CFR §52.21(m) is not required, or provided in this application.

4.3 NHPA – National Historic Preservation Act

To expedite the processing of this application, Table 4-3 lists the potentially affected cultural resources within Mountrail County affected by the proposed Facility.

4.4 ESA – Endangered Species Act

To expedite the processing of this application, Table 4-4 below lists the potentially affected species within Mountrail County, North Dakota affected by the proposed Facility.

Table 4-1. Greenhouse Gas Emission Rates

Emission Source	Equipment ID	CO ₂		CH ₄		N ₂ O		CO ₂ e	
		lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy
Fugitives	FUG	0.08	0.35	2.52	11.03	--	--	63.04	276.13
Compressor Engine	C-1	1,332.78	5,837.56	15.15	66.34	0.01	0.02	1,713.00	7,502.93
Compressor Engine	C-2	1,332.78	5,837.56	15.15	66.34	0.01	0.02	1,713.00	7,502.93
Compressor Engine	C-3	1,332.78	5,837.56	15.15	66.34	0.01	0.02	1,713.00	7,502.93
Reboiler	R-1	28.42	124.49	5.45E-04	2.39E-03	5.21E-04	2.28E-03	28.59	125.23
Condensate Loading	TL-1	2.14E-03	1.65E-04	3.23E-03	2.49E-04	--	--	0.08	0.01
Flare	FL-1	162,455.57	26,085.51	209.22	33.61	0.30	0.05	167,776.78	26,940.36
Vapor Combustor	EC-1	1,014.35	1,240.06	0.08	0.34	1.91E-03	2.32E-03	1,016.93	1,251.39
TOTAL GHG EMISSIONS:		167,496.76	44,963.09	257.26	243.99	0.32	0.12	174,024.42	51,099.74

Table 4-2. Federal Standard Applicability

Federal Standard	Name	Applicability
New Source Performance Standards		
NSPS Kb	Standards of Performance for Storage Vessels for Petroleum Liquids for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984	<p>This subpart applies to storage vessels for petroleum liquids before custody transfer which have a storage capacity greater than 42,000 gallons (10,000 barrels) that were constructed after July 23, 1984.</p> <p><i>All tanks at this facility will have a storage capacity <1,589.874 cubic meters (10,000 barrels). Therefore, the storage vessels are not affected facilities under §60.110b(d)(4), and NSPS Subpart Kb is not applicable to the facility.</i></p>
NSPS Dc	Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units	<p>This subpart applies to each steam generating unit greater than 10 MMBtu/hr but less than 100 MMBtu/hr constructed after June 9, 1989.</p> <p><i>The reboiler does not use a heat transfer medium and is less than 10 MMBtu/hr, therefore it is not affected facilities under this subpart.</i></p>
NSPS IIII	Standards of Performance for Stationary Compression Ignition Internal Combustion Engines (ICE)	<p>Subpart IIII applies to manufacturers, owners, and operators of compression ignition ICE.</p> <p><i>The facility does not include compression ignited internal combustion engines; therefore, this subpart does not apply.</i></p>
NSPS JJJJ	Standards of Performance for Stationary Spark Ignition Internal Combustion Engines (ICE)	<p>Subpart JJJJ applies to manufacturers, owners, and operators of spark ignition ICE.</p> <p><i>The facility will include three spark ignition, natural gas-fired, lean burn ICE (C-1 to C-3) ≥ 1,350 hp which commenced construction between July 1, 2007 and June 30, 2010. The three natural gas-fired lean burn Caterpillar G3606 LE engines are applicable to the testing, maintenance, recordkeeping and reporting requirements under JJJJ [60.4230(a)(4)(i & iii)].</i></p>
NSPS OOOO	Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After August 23, 2011 and On or Before September 18, 2015	<p>This subpart establishes standards for emission sources at oil and gas production facilities that were constructed after August 23, 2011 and on or before September 18, 2015.</p> <p><i>The facility will be constructed after September 18, 2015, and therefore, it will not be subject to Subpart OOOO.</i></p>

Table 4-2: Federal Standard Applicability

Federal Standard	Name	Applicability
NSPS OOOOa	Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After September 18, 2015	<p>This subpart establishes standards for emission sources at oil and gas production facilities that were constructed after September 18, 2015.</p> <p><i>The subject facility will be constructed after September 18, 2015 and is therefore potentially subject to this subpart. The rule includes requirements for natural gas gathering and boosting stations for reciprocating compressors (replacement of rod packing, performance testing, recordkeeping, reporting), pneumatic controllers (gas bleed limits), and storage tanks (95% reduction in VOC emissions if the documented potential to emit > 6 tpy).</i></p> <p><i>Storage Vessel Affected Facility: The condensate storage tanks at the facility are not subject to NSPS OOOOa since the tanks are controlled with VOC emissions being less than 6 tpy/tank.</i></p> <p><i>Reciprocating compressors: Subject compressors must replace rod packing every 26,000 hours or route to a closed vent system (approximately every three years under maximum operating rates) as specified in §60.5385a(a). Currently, the compressors are not routed to closed vent systems, but compliance will be maintained through operation and maintenance procedures.</i></p> <p><i>Pneumatic controller affected facility: All continuous bleed pneumatic controllers must be low (\leq 6 scf/hr natural gas bleed rate) or no bleed. All continuous pneumatic controllers at the facility are low bleed and as such the tagging and reporting requirements of this subpart are not applicable.</i></p> <p><i>Fugitive Monitoring: Under OOOOa, subject compressor stations must monitor for equipment leaks using optical gas imaging (OGI) or approved alternate method. Subject facilities must have an OGI monitoring plan and conduct initial leak monitoring survey within 60 days of startup. VHGS will comply with the monitoring, recordkeeping and reporting.</i></p>

Table 4-2: Federal Standards Applicability		
Federal Standard	Name	Applicability
Maximum Achievable Control Technology		
MACT HH	National Emissions Standards for Hazardous Air Pollutants from Oil and Natural Gas Production Facilities	<p>This subpart establishes emission standards and control requirements for oil and natural gas production facilities at both major and area sources.</p> <p><i>The facility is an area source of HAPs and operates a TEG dehydrator; however, the benzene emissions the TEG dehydrator are expected to be below 0.90 Mg/yr (1 tpy) with federally enforceable controls and therefore the TEG dehydrator does not meet the definition of a large dehydrator in 40 CFR §63.761. The dehydrator is only subject to recordkeeping requirements of this VHGS will conduct emissions calculations annually as prescribed in 40 CFR §63.764(e) to demonstrate compliance.</i></p>
MACT ZZZZ	National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (RICE)	<p>This subpart applies to all spark and compression ignition ICE.</p> <p><i>The compressor engines are considered new stationary RICE located at an area source and therefore are subject to maintenance practice Subpart ZZZZ. In accordance with §63.6590(c) and (c)(1), the engine must comply with the requirements of NSPS JJJJ.</i></p>
MACT JJJJJ	National Emissions Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers at Area Sources	<p>This subpart applies to boilers at area sources of HAPs.</p> <p><i>The glycol reboiler heater (R-1) does not meet the definition of a boiler under 40 CFR §63.11237. Further, the burner is gas-fired and meet the exemption under 40 CFR §63.11195(e).</i></p>

Table 4-8. Potentially Affected Cultural Resources¹

National Register of Historic Places¹	
Resource	Location
Evans Site	North Main Street, Stanley, ND
Great Northern Railway Underpass	North Main Street, Stanley, ND
Mountrail County Courthouse	North Main Street, Stanley, ND

¹ <http://nrhp.focus.nps.gov/natreghome.do?searchtype=natreghome>

Table 4-4. Potentially Affected Species²

Name	Group	Status
Whooping crane (<i>Grus Americana</i>)	Birds	Endangered
Piping plover (<i>Charadrius melanotos</i>)	Birds	Threatened
Least tern (<i>Sterna antillarum</i>)	Birds	Endangered
Red knot (<i>Calidris canutus rufa</i>)	Birds	Threatened
Pallid sturgeon (<i>Scaphirhynchus albus</i>)	Fish	Endangered
Dakota skipper (<i>Hesperia dacotae</i>)	Insects	Threatened
Gray Wolf (<i>Canis lupus</i>)	Mammals	Endangered
Northern long-eared bat (<i>Myotis septentrionalis</i>)	Mammals	Threatened

² <https://ecos.fws.gov/ecp0/reports/species-by-current-range-county?fips=38061>

Based on species-specific information Ramboll has concluded that the project qualifies for Criterion B under the FIP; not likely to adversely affect listed T&E species or Critical Habitat. Based on the existing footprint of the facility, the Project will not affect known historic or cultural resources. If sensitive resources are identified on-site during implementation of the Project, VHGS will coordinate with the appropriate agencies.

APPENDIX A
EMISSION CALCULATIONS

Van Hook Gathering Services, LLC
 FBIR Compressor Station
 Emissions Summary

Table 3-1. Proposed Actual Maximum Air Pollutant Emission Rates

Emission Source	Equipment ID	VOC		NO _x		CO		PM ₁₀		PM _{2.5}		SO ₂		H ₂ S		Benzene		Formaldehyde		HAP	
		lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy
Fugitives	FUG	3.05	13.37	--	--	--	--	--	--	--	--	--	--	--	2.32E-03	0.01	--	--	0.05	0.24	
Compressor Engine	C-1	2.47	10.80	5.87	25.71	0.94	4.11	0.12	0.53	0.12	0.53	0.01	0.02	5.70E-05	2.50E-04	4.89E-03	0.02	0.51	2.23	0.74	3.26
Compressor Engine	C-2	2.47	10.80	5.87	25.71	0.94	4.11	0.12	0.53	0.12	0.53	0.01	0.02	5.70E-05	2.50E-04	4.89E-03	0.02	0.51	2.23	0.74	3.26
Compressor Engine	C-3	2.47	10.80	5.87	25.71	0.94	4.11	0.12	0.53	0.12	0.53	0.01	0.02	5.70E-05	2.50E-04	4.89E-03	0.02	0.51	2.23	0.74	3.26
Reboiler	R-1	0.01	0.02	0.10	0.44	0.09	0.37	0.01	0.03	0.01	0.03	6.09E-04	2.67E-03	1.56E-06	6.83E-06	2.13E-06	9.33E-06	7.61E-05	3.33E-04	1.92E-03	0.01
Condensate Loading	TL-1	1.66	0.13	--	--	--	--	--	--	--	--	--	--	--	1.45E-03	1.12E-04	--	--	0.06	4.30E-03	
Flare	FL-1	372.58	59.80	94.05	15.10	511.74	82.17	10.31	1.65	10.31	1.65	--	--	--	--	0.48	0.08	--	--	10.74	1.72
Vapor Combustor	EC-1	4.25	5.63	0.59	0.72	3.20	3.91	0.06	0.08	0.06	0.08	--	--	--	--	0.01	0.01	--	--	0.19	0.20
TOTAL EMISSIONS:		388.95	111.35	112.35	93.39	517.85	98.79	10.74	3.36	10.74	3.36	0.02	0.07	1.72E-04	7.56E-04	0.51	0.16	1.53	6.68	13.28	11.94
TOTAL EMISSIONS (Excluding Fugitives):		385.89	97.98	112.35	93.39	517.85	98.79	10.74	3.36	10.74	3.36	0.02	0.07	1.72E-04	7.56E-04	0.51	0.15	1.53	6.68	13.23	11.70
MAXIMUM OPERATING SCHEDULE		Hours/Day		24	Days/Week		7	Weeks/Year		52	Hours/Year		8760								

Van Hook Gathering Services, LLC
 FBIR Compressor Station
 Emissions Summary

Table 3-2. Uncontrolled PTE Maximum Air Pollutant Emission Rates

Emission Source	Equipment ID	VOC		NO _x		CO		PM ₁₀		PM _{2.5}		SO ₂		H ₂ S		Benzene		Formaldehyde		HAP		
		lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	
Compressor Engine	C-1	2.47	10.80	5.87	25.71	0.94	4.11	0.12	0.53	0.12	0.53	0.01	0.02	5.70E-05	2.50E-04	4.89E-03	0.02	0.51	2.23	0.74	3.26	
Compressor Engine	C-2	2.47	10.80	5.87	25.71	0.94	4.11	0.12	0.53	0.12	0.53	0.01	0.02	5.70E-05	2.50E-04	4.89E-03	0.02	0.51	2.23	0.74	3.26	
Compressor Engine	C-3	2.47	10.80	5.87	25.71	0.94	4.11	0.12	0.53	0.12	0.53	0.01	0.02	5.70E-05	2.50E-04	4.89E-03	0.02	0.51	2.23	0.74	3.26	
Condensate Tank	TK-1	31.33	77.61	--	--	--	--	--	--	--	--	--	--	--	--	--	0.06	0.10	--	--	1.34	2.27
Condensate Tank	TK-2	31.33	77.61	--	--	--	--	--	--	--	--	--	--	--	--	--	0.06	0.10	--	--	1.34	2.27
Condensate Tank	TK-3	31.33	77.61	--	--	--	--	--	--	--	--	--	--	--	--	--	0.06	0.10	--	--	1.34	2.27
Condensate Tank	TK-4	31.33	77.61	--	--	--	--	--	--	--	--	--	--	--	--	--	0.06	0.10	--	--	1.34	2.27
TEG Dehydrator	DHY-1	8.70	38.11	--	--	--	--	--	--	--	--	--	--	--	--	--	0.01	0.03	--	--	0.07	0.31
Reboiler	R-1	0.01	0.02	0.10	0.44	0.09	0.37	0.01	0.03	0.01	0.03	6.09E-04	2.67E-03	1.56E-06	6.83E-06	2.13E-06	9.33E-06	--	--	1.92E-03	0.01	
Condensate Loading	TL-1	127.93	9.87	--	--	--	--	--	--	--	--	--	--	--	--	--	0.11	0.01	7.61E-05	3.33E-04	4.28	0.33
Flare	FL-1	372.58	1,625.37	94.05	410.57	511.74	2,233.99	10.31	44.99	10.31	44.99	--	--	--	--	--	0.48	2.10	--	--	10.74	46.72
MSS Blowdowns	MSS-Blowdown	94.92	7.40	--	--	--	--	--	--	--	--	--	--	--	--	--	0.18	0.01	--	--	3.90	0.30
TOTAL EMISSIONS:		736.87	2,023.63	111.76	488.14	514.65	2,246.70	10.68	46.61	10.68	46.61	0.02	0.07	1.72E-04	7.56E-04	1.02	2.62	1.53	6.68	26.58	66.52	
MAXIMUM OPERATING SCHEDULE:		Hours/Day		24	Days/Week		7	Weeks/Year		52	Hours/Year		8760									

Van Hook Gathering Services, LLC
 FBIR Compressor Station
 Emissions Summary

Table 4-1. Greenhouse Gas Emission Rates

Emission Source	Equipment ID	CO ₂		CH ₄		N ₂ O		CO ₂ e	
		lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy
Fugitives	FUG	0.08	0.35	2.52	11.03	--	--	63.04	276.13
Compressor Engine	C-1	1,332.78	5,837.56	15.15	66.34	0.01	0.02	1,713.00	7,502.93
Compressor Engine	C-2	1,332.78	5,837.56	15.15	66.34	0.01	0.02	1,713.00	7,502.93
Compressor Engine	C-3	1,332.78	5,837.56	15.15	66.34	0.01	0.02	1,713.00	7,502.93
Reboiler	R-1	28.42	124.49	5.45E-04	2.39E-03	5.21E-04	2.28E-03	28.59	125.23
Condensate Loading	TL-1	2.14E-03	1.65E-04	3.23E-03	2.49E-04	--	--	0.08	0.01
Flare	FL-1	162,455.57	26,085.51	209.22	33.61	0.30	0.05	167,776.78	26,940.36
Vapor Combustor	EC-1	1,014.35	1,240.06	0.08	0.34	1.91E-03	2.32E-03	1,016.93	1,249.20
TOTAL EMISSIONS:		167,496.76	44,963.09	257.26	243.99	0.32	0.12	174,024.42	51,099.74

Van Hook Gathering Services, LLC
FBIR Compressor Station
Facility Information

Oil and Gas Site General Information	
--------------------------------------	--

Administrative Information	
Company Name	Van Hook Gathering Services, LLC
Facility/Well Name	FBIR Compressor Station
Nearest City/Town	New Town
Latitude/Longitude	47.841273, -102.580244
County	Mountrail

Technical Information	
Produced Gas Site Throughput (MMSCF/day)	22.00
Produced Gas Site Throughput (MMSCF/year)	8,030.00
Oil/Condensate Site Throughput (bbl/day)	140.00
Oil/Condensate Site Throughput (bbl/year)	51,100.00
Are there any sour gas streams at this site?	No

Equipment/Process Types	How many for this project?
Engines	YES
IC Engines	3
Turbines	0
Diesel Engines	0
Heaters-Boilers	1
Separators	6
Oil / Condensate Tanks	4
Produced Water Tanks	0
Miscellaneous Tanks	0
Loading Docks	1
Glycol Units	1
Amine Units	0
Vapor Recovery Units	0
Flares-Vapor Combustors	2
Chemical Oxidizers	0
MISS	YES

Van Hook Gathering Services, LLC
 FBIR Compressor Station
 Physical Properties

Process Stream	RTFX Liquid	Compressor		Condensate		Condensate Tank		Condensate		Condensate		First Stage Knockout		Flash Tank		Liquids to Slug Catcher		Liquids to Slug Catcher		Total Condensate Emissions	
		Inlet	Emissions	Soldad	Soldad	Soldad	Soldad	Soldad	Soldad	Soldad	Soldad	Soldad	Soldad	Soldad	Soldad	Soldad	Soldad	Soldad	Soldad	Soldad	
Composition	Shuttle Pump Block	Soldad	Soldad	Soldad	Soldad	Soldad	Soldad	Soldad	Soldad	Soldad	Soldad	Soldad	Soldad	Soldad	Soldad	Soldad	Soldad	Soldad	Soldad	Soldad	
Phase: Total	To Block	XFS2	VRU Mixer	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
Std. Vapor Volumetric Flow		MMSCFD	MMSCFD	MMSCFD	MMSCFD	MMSCFD	MMSCFD	MMSCFD	MMSCFD	MMSCFD	MMSCFD	MMSCFD	MMSCFD	MMSCFD	MMSCFD	MMSCFD	MMSCFD	MMSCFD	MMSCFD	MMSCFD	
CO2	--	0.14	3.83E-07	8.63E-06	6.25E-05	1.09E-06	6.63E-05	0.14	0.14	1.74E-04	--	0.14	1.74E-04	0.14	1.74E-04	0.14	7.11E-05	6.40E-05			
H2S	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
N2	--	1.23	3.35E-09	7.04E-07	5.68E-05	9.50E-09	5.71E-05	1.23	1.23	2.34E-04	--	1.23	2.33E-04	1.23	5.75E-05	5.68E-05					
Methane	--	11.85	1.58E-06	8.26E-05	1.88E-03	4.50E-06	1.92E-03	11.84	11.84	0.01	--	11.85	0.01	11.85	0.01	11.85	0.01	1.96E-03	1.89E-03		
Ethane	--	4.49	6.62E-05	1.39E-03	4.19E-03	1.88E-04	4.77E-03	4.48	4.49	0.01	--	4.49	0.01	4.49	0.01	4.49	0.01	4.50	0.01	4.44E-03	
Propane	--	2.91	1.16E-04	0.01	0.01	3.29E-04	0.01	2.88	2.89	0.03	--	2.91	0.03	2.91	0.03	2.92	0.01	0.01	0.01		
Isobutane	--	0.28	1.77E-05	2.94E-03	8.04E-04	5.02E-05	1.43E-03	0.27	0.27	0.01	--	0.28	0.01	0.28	0.01	0.28	0.01	3.74E-03	8.72E-04		
n-Butane	--	0.86	6.29E-05	0.02	2.69E-03	1.79E-04	0.01	0.82	0.84	0.03	--	0.86	0.03	0.87	0.03	0.87	0.02	2.93E-03			
Isopentane	--	0.13	1.03E-05	0.01	4.56E-04	2.91E-05	1.02E-03	0.12	0.12	0.02	--	0.13	0.01	0.14	0.01	0.14	0.01	4.95E-04			
n-Pentane	--	0.19	1.52E-05	0.01	6.53E-04	4.32E-05	1.53E-03	0.16	0.17	0.03	--	0.19	0.03	0.20	0.03	0.20	0.01	7.12E-04			
Cyclopentane	--	2.56E-04	1.90E-08	2.82E-05	9.03E-07	5.41E-08	2.18E-06	1.92E-04	2.22E-04	6.31E-05	--	2.56E-04	6.31E-05	2.85E-04	2.91E-05	9.77E-07					
n-Hexane	--	0.05	4.36E-06	0.01	1.70E-04	1.24E-05	4.55E-04	0.02	0.03	0.03	--	0.05	0.03	0.06	0.01	0.06	0.01	1.87E-04			
Cyclohexane	--	0.01	4.21E-07	2.19E-03	2.15E-05	1.19E-06	5.72E-05	1.88E-03	4.10E-03	4.05E-03	--	0.01	4.05E-03	0.01	2.21E-03	0.01	2.31E-05				
i-C6	--	0.07	6.34E-06	0.01	2.53E-04	1.80E-05	6.47E-04	0.04	0.05	0.03	--	0.07	0.03	0.08	0.01	0.08	0.01	2.77E-04			
n-Heptane	--	0.04	3.71E-06	0.04	1.47E-04	1.05E-05	4.26E-04	3.44E-03	0.05	0.04	--	0.04	0.04	0.08	0.04	0.08	0.04	1.61E-04			
Methylcyclohexane	--	4.11E-03	3.78E-07	4.36E-03	1.49E-05	1.07E-06	4.27E-05	3.24E-04	4.70E-03	3.79E-03	--	4.11E-03	3.79E-03	0.01	4.37E-03	0.01	4.37E-03	1.63E-05			
2,2,4-Trimethylpentane	--	4.49E-03	4.05E-07	4.32E-03	1.62E-05	1.15E-06	4.60E-05	3.99E-04	4.74E-03	4.09E-03	--	4.49E-03	4.09E-03	0.01	4.34E-03	0.01	4.34E-03	1.77E-05			
Benzene	--	2.80E-03	1.46E-07	7.90E-04	1.00E-05	4.14E-07	2.61E-05	1.28E-03	2.08E-03	1.52E-03	--	2.80E-03	1.52E-03	3.60E-03	8.00E-04	1.06E-05					
Toluene	--	8.07E-04	4.39E-08	8.58E-04	2.91E-06	1.25E-07	8.33E-06	6.91E-05	9.31E-04	7.38E-04	--	8.07E-04	7.38E-04	1.67E-03	8.61E-04	3.08E-06					
Ethylbenzene	--	6.31E-06	3.62E-10	2.21E-05	2.28E-08	1.03E-09	7.05E-08	7.06E-08	2.22E-05	6.28E-06	--	6.31E-06	6.29E-06	2.84E-05	2.21E-05	2.42E-08					
m-Xylene	--	8.70E-05	6.51E-09	3.32E-04	3.14E-07	1.85E-08	9.74E-07	8.02E-07	3.32E-04	8.67E-05	--	8.70E-05	8.69E-05	4.19E-04	3.32E-04	3.39E-07					
n-Octane	--	1.56E-03	1.41E-07	0.01	5.58E-06	4.01E-07	1.75E-05	1.69E-05	0.01	1.55E-03	--	1.56E-03	1.55E-03	0.01	0.01	6.12E-06					
n-Nonane	--	1.25E-04	1.20E-08	1.80E-03	4.55E-07	3.41E-08	1.56E-06	1.14E-07	1.79E-03	1.26E-04	--	1.25E-04	1.27E-04	1.92E-03	1.80E-03	5.01E-07					
n-Decane	--	4.38E-06	3.80E-10	1.99E-04	1.54E-08	1.08E-09	5.62E-08	6.00E-10	1.99E-04	4.39E-06	--	4.38E-06	4.41E-06	2.04E-04	1.99E-04	1.69E-08					
Water	--	0.05	9.66E-07	0.03	1.95E-04	2.74E-06	5.98E-04	0.03	0.06	0.02	--	0.05	0.02	0.08	0.03	0.03	0.03	1.99E-04			
TEG	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Mass Fraction																					
CO2	0.01	1.11E-03	3.05E-05	3.56E-03	1.11E-03	2.25E-03	0.01	0.01	4.23E-04	0.01	4.23E-04	0.01	4.23E-04	0.01	2.37E-04	0.01	2.37E-04	0.01	3.39E-03		
H2S	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
N2	0.06	6.19E-06	1.58E-06	2.06E-03	6.19E-06	1.24E-03	0.06	0.06	3.60E-04	0.06	3.60E-04	0.06	3.60E-04	0.06	1.22E-04	0.06	1.22E-04	0.06	1.92E-03		
Methane	0.32	1.68E-03	1.06E-04	0.04	1.68E-03	0.02	0.33	0.32	0.01	0.32	0.01	0.31	0.32	0.01	0.31	0.31	0.31	0.31	0.31	0.04	
Ethane	0.23	0.13	3.36E-03	0.16	0.13	0.															

**Van Hook Gathering Services, LLC
FBIR Compressor Station
Physical Properties**

Process Streams	Status	BTEX Liquids	Compressor Inlet	Condensate Loading Emissions	Condensate Sales	Condensate Tank Flashing Emissions	Condensate Tank W&B Emissions	Condensate Tanks Hourly Flashing	Dehy Inlet	Facility Inlet	First Stage Knockout Liquids to Suction Scrubber	Flash Tank Oil	Gas From Slug Catcher	Liquids to Suction Scrubber	Slug Catcher Inlet	Slug Catcher Liquids	Total Condensate Emissions
		Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Phase: Total	To Block:	XFS2	VRU Mixer	Condensate Tank Mixer	Tanks Condensate Tank Mixer	Condensate Tank Mixer	Condensate Tank Mixer	Condensate Tank Mixer	3rd Stage KO XFS1	SAT-1 Inlet Liquid Mixer	Knockout RCYL-1	XFS3 Tank Mixer	Catcher VRU Mixer	RCYL-1 Inlet Liquid Mixer	Inlet Liquid Catcher	Inlet Slug Catcher	Inlet Condensate Tank Mixer
Mole Fraction																	
CO2																	
H2S																	
N2																	
Methane																	
Ethane																	
Propane																	
Isobutane																	
n-Butane																	
Isopentane																	
n-Pentane																	
Cyclopentane																	
n-Hexane																	
Cyclohexane																	
i-C6																	
n-Heptane																	
Methylcyclohexane																	
2,2,4-Trimethylpentane																	
Benzene																	
Toluene																	
Ethylbenzene																	
m-Xylene																	
n-Octane																	
n-Nonane																	
n-Decane																	
Water																	
TEG																	
Mass Flow		lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h
CO2		--	664.25	1.85E-03	0.04	0.30	0.01	0.32	663.41	663.75	0.84	--	664.25	0.84	664.59	0.34	0.31
H2S		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N2		--	3,776.36	1.03E-05	2.16E-03	0.17	2.92E-05	0.18	3,775.68	3,775.81	0.72	--	3,776.36	0.72	3,776.53	0.18	0.17
Methane		--	20,870.65	2.79E-03	0.15	3.32	0.01	3.38	20,859.59	20,862.80	11.32	--	20,870.65	11.31	20,874.11	3.46	3.33
Ethane		--	14,834.05	0.22	4.59	13.83	0.62	15.75	14,792.06	14,810.53	41.97	--	14,834.05	41.95	14,852.47	18.42	14.67
Propane		--	14,066.73	0.56	37.16	29.36	1.59	41.66	13,938.71	14,005.65	127.67	--	14,066.73	127.59	14,133.25	66.52	31.51
Isobutane		--	1,762.54	0.11	18.75	5.13	0.32	9.12	1,719.22	1,743.15	43.30	--	1,762.54	43.27	1,786.42	23.88	5.57
n-Butane		--	5,460.88	0.40	96.19	17.14	1.14	33.06	5,246.93	5,360.23	214.12	--	5,460.88	213.99	5,574.22	113.34	18.68
Isopentane		--	1,047.99	0.08	53.15	3.61	0.23	8.07	929.31	986.00	118.83	--	1,047.99	118.75	1,104.75	56.76	3.92
n-Pentane		--	1,479.57	0.12	107.78	5.18	0.34	12.09	1,242.50	1,355.44	237.25	--	1,479.57	237.09	1,592.53	112.95	5.64
Cyclopentane		--	1.97	1.47E-04	0.22	0.01	4.16E-04	0.02	1.48	1.71	0.49	--	1.97	0.49	2.19	0.22	0.01
n-Hexane		--	443.71	0.04	134.72	1.61	0.12	4.31	177.03	314.23	266.03	--	443.71	265.81	580.04	136.33	1.77
Cyclohexane		--	54.90	3.89E-03	20.20	0.20	0.01	0.53	17.38	37.87	37.46	--	54.90	37.43	75.30	20.40	0.21
i-C6		--	664.24	0.06	136.84	2.39	0.17	6.12	359.22	499.54	304.18	--	664.24	303.93	803.47	139.23	2.62
n-Heptane		--	449.04	0.04	484.27	1.62	0.12	4.68	37.86	523.81	411.20	--	449.04	411.11	934.92	485.88	1.77
Methylcyclohexane		--	44.34	4.07E-03	46.97	0.16	0.01	0.46	3.50	50.63	40.84	--	44.34	40.83	91.46	47.13	0.18
2,2,4-Trimethylpentane		--	56.35	0.01	54.22	0.20	0.01	0.58	5.01	59.46	51.33	--	56.35	51.31	110.77	54.43	0.22
Benzene		--	24.02	1.25E-03	6.78	0.09	3.55E-03	0.22	10.96	17.86	13.03	--	24.02	13.02	30.89	6.87	0.09
Toluene		--	8.17	4.44E-04	8.68	0.03	1.26E-03	0.08	0.70	9.41	7.47	--	8.17	7.47	16.88	8.71	0.03
Ethylbenzene		--	0.07	4.22E-06	0.26	2.66E-04	1.20E-05	8.22E-04	8.23E-04	0.26	0.07	--	0.07	0.07	0.33	0.26	2.82E-04
m-Xylene		--	1.01	7.59E-05	3.87	3.66E-03	2.15E-04	0.01	0.01	3.87	1.01	--	1.01	1.01	4.89	3.87	3.95E-03
n-Octane		--	19.55	1.77E-03	74.63	0.07	0.01	0.22	0.21	74.75	19.46	--	19.55	19.50	94.25	74.70	0.08
n-Nonane		--	1.76	1.69E-04	25.28	0.01	4.80E-04	0.02	1.61E-03	25.27	1.77	--	1.76	1.78	27.05	25.29	0.01
n-Decane		--	0.07	5.94E-06	3.12	2.41E-04	1.69E-05	8.78E-04	9.38E-06	3.11	0.07	--	0.07	0.07	3.18	3.12	2.64E-04
Water		--	104.09	1.91E-03	49.78	0.39	0.01	1.18	59.25	109.42	44.83	--	104.09	44.84	154.26	50.17	0.39
TEG		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Temperature	°F		42.59	65.34	45.94	45.94	6										

**Van Hook Gathering Services, LLC
FBIR Compressor Station
Physical Properties**

Process Streams		Total Liquids to Tanks	Water	Wet Gas Analysis	1st Stage Compressor	1st Stage KO Inlet	1st Stage KO Outlet Gas	2nd Stage Compressed Gas	2nd Stage Fluids to 1st Stage	2nd Stage KO Fluids	2nd Stage KO Inlet	2nd Stage KO Outlet Gas	3rd Stage Fluids to Second Stage	3rd Stage KO Fluids	3rd Stage KO Inlet	Blowdown	Boilup	Condenser Fluids to Tanks	Dry Gas to Sales	
		Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved BTEX	Solved Glycol		
Composition	Status:	From Block	To Block	Tank Mixer Condensate Tanks	SAT-1	SAT-1	1st Stage Mixer 1st Stage Knockout	1st Stage Knockout	2nd Stage Second Stage Mixer	2nd Stage Knockout	2nd Stage Mixer	2nd Stage Knockout	3rd Stage Second Stage Mixer	3rd Stage Knockout	3rd Stage Mixer	MKUP-1	Reboiler	Condenser	Contactor	
Std. Vapor Volumetric Flow		MMSCFD	MMSCFD	MMSCFD	MMSCFD	MMSCFD	MMSCFD	MMSCFD	MMSCFD	MMSCFD	MMSCFD	MMSCFD	MMSCFD	MMSCFD	MMSCFD	MMSCFD	MMSCFD	MMSCFD		
CO2		7.11E-05	--	0.14	0.14	0.14	0.14	0.14	0.01	0.01	0.16	0.15	0.02	0.02	0.15	1.81E-06	5.57E-05	--	0.14	
H2S		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
N2		5.75E-05	--	1.23	1.23	1.24	1.24	1.24	0.01	0.01	1.29	1.28	0.06	0.06	1.28	9.82E-13	4.56E-10	--	1.23	
Methane		1.96E-03	--	11.84	11.85	12.08	12.07	12.07	0.23	0.23	12.98	12.75	0.91	0.91	12.75	4.47E-09	7.27E-07	--	11.84	
Ethane		0.01	--	4.49	4.49	4.87	4.85	4.85	0.37	0.37	5.59	5.22	0.74	0.74	5.22	2.84E-07	1.89E-05	--	4.48	
Propane		0.01	--	2.89	2.91	3.58	3.55	3.55	0.68	0.68	4.36	3.68	0.81	0.81	3.68	1.73E-06	7.43E-05	--	2.88	
Isobutane		3.74E-03	--	0.27	0.28	0.41	0.41	0.41	0.14	0.14	0.52	0.38	0.11	0.11	0.38	2.18E-07	8.66E-06	--	0.27	
n-Butane		0.02	--	0.84	0.86	1.46	1.43	1.43	0.60	0.60	1.82	1.22	0.39	0.39	1.22	2.95E-06	8.56E-05	--	0.82	
Isopentane		0.01	--	0.12	0.13	0.32	0.31	0.31	0.19	0.19	0.39	0.20	0.08	0.08	0.20	1.33E-06	2.96E-05	--	0.12	
n-Pentane		0.01	--	0.17	0.19	0.51	0.48	0.48	0.32	0.32	0.60	0.28	0.12	0.12	0.28	2.09E-06	4.15E-05	--	0.16	
Cyclopentane		2.91E-05	--	2.22E-04	2.56E-04	7.96E-04	7.33E-04	7.33E-04	5.41E-04	5.41E-04	9.02E-04	3.61E-04	1.69E-04	1.69E-04	3.61E-04	5.07E-08	3.44E-07	--	1.92E-04	
n-Hexane		0.01	--	0.03	0.05	0.18	0.15	0.15	0.13	0.13	0.18	0.04	0.03	0.03	0.04	5.62E-07	8.15E-06	--	0.02	
Cyclohexane		2.21E-03	--	4.10E-03	0.01	0.02	0.02	0.02	0.02	0.02	0.02	4.56E-03	2.68E-03	2.68E-03	4.56E-03	4.39E-07	2.35E-06	--	1.88E-03	
i-C6		0.01	--	0.05	0.07	0.26	0.23	0.23	0.19	0.19	0.28	0.08	0.04	0.04	0.08	1.04E-06	1.60E-05	--	0.04	
n-Heptane		0.04	--	0.05	0.04	0.11	0.08	0.08	0.07	0.07	0.08	0.01	0.01	0.01	0.01	1.96E-07	1.92E-06	--	3.44E-03	
Methylcyclohexane		4.37E-03	--	4.70E-03	4.11E-03	0.01	0.01	0.01	0.01	0.01	0.01	1.00E-03	6.75E-04	6.77E-04	1.00E-03	6.93E-08	3.30E-07	--	3.24E-04	
2,2,4-Trimethylpentane		4.34E-03	--	4.74E-03	4.49E-03	0.01	0.01	0.01	0.01	0.01	0.01	1.21E-03	8.04E-04	8.06E-04	1.21E-03	2.22E-08	2.14E-07	--	3.99E-04	
Benzene		8.00E-04	--	2.08E-03	2.80E-03	0.01	0.01	0.01	0.01	0.01	0.01	2.82E-03	1.54E-03	1.54E-03	2.82E-03	3.69E-06	4.63E-06	--	1.27E-03	
Toluene		8.61E-04	--	9.31E-04	8.07E-04	2.25E-03	1.52E-03	1.52E-03	1.45E-03	1.45E-03	1.66E-03	2.11E-04	1.42E-04	1.42E-04	2.11E-04	2.35E-07	1.90E-07	--	6.88E-05	
Ethylbenzene		2.21E-05	--	2.22E-05	6.31E-06	1.12E-05	4.97E-06	4.97E-06	4.93E-06	4.93E-06	4.90E-06	5.20E-06	3.04E-07	2.33E-07	2.33E-07	3.04E-07	2.22E-10	1.39E-10	--	6.90E-08
m-Xylene		3.32E-04	--	3.32E-04	8.70E-05	1.50E-04	6.32E-05	6.32E-05	6.29E-05	6.29E-05	6.24E-05	6.60E-05	3.57E-06	2.78E-06	2.77E-06	3.57E-06	2.40E-09	1.43E-09	--	7.99E-07
n-Octane		0.01	--	0.01	1.56E-03	2.74E-03	1.18E-03	1.18E-03	1.18E-03	1.18E-03	1.17E-03	1.24E-03	7.15E-05	5.46E-05	5.46E-05	7.15E-05	1.12E-09	7.70E-09	--	1.69E-05
n-Nonane		1.80E-03	--	1.79E-03	1.25E-04	1.60E-04	3.42E-05	3.42E-05	3.48E-05	3.48E-05	3.41E-05	3.49E-05	7.79E-07	6.77E-07	6.64E-07	7.79E-07	9.51E-12	5.02E-11	--	1.14E-07
n-Decane		1.99E-04	--	1.99E-04	4.38E-06	4.88E-06	4.89E-07	4.89E-07	5.02E-07	4.89E-07	4.94E-07	5.52E-09	5.08E-09	4.92E-09	5.52E-09	5.16E-14	1.88E-13	--	6.00E-10	
Water		0.03	0.06	--	0.05	0.22	0.20	0.20	0.17	0.17	0.26	0.08	0.05	0.05	0.08	0.01	1.23E-03	--	0.02	
TEG		--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.01	4.28E-07	--	1.37E-05	
Mass Fraction		CO2	2.37E-04	--	0.01	0.01	0.01	0.01	0.143E-03	1.43E-03	0.01	0.01	0.01	0.01	0.01	5.33E-05	0.06	--	0.01	
H2S		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
N2		1.22E-04	--	0.06	0.06	0.05	0.05	0.05	1.54E-03	1.54E-03	0.04	0.05	0.01	0.05	1.84E-11	3.03E-07	--	0.06		
Methane		2.38E-03	--	0.32	0.32	0.25	0.26	0.26	0.02	0.02	0.24	0.29	0.12	0.29	4.78E-08	2.77E-04	--	0.33		
Ethane		0.01	--	0.23	0.23	0.19	0.19	0.19	0.07	0.07	0.19	0.22	0.18	0.18	0.22	5.70E-06	0.01	--	0.23	
Propane		0.05	--	0.21	0.21	0.21	0.21	0.21	0.18	0.18	0.22	0.23	0.28	0.28	0.23	5.08E-05	0.08	--	0.22	
Isobutane		0.02	--	0.03	0.03	0.03	0.03	0.03	0.05	0.05	0.03	0.03	0.05	0.05	0.03	8.46E-06	0.01	--	0.03	
n-Butane		0.08	--	0.08	0.08	0.11	0.11	0.11	0.21	0.21	0.12	0.10	0.18	0.18	0.10	1.14E-04	0.12	--	0.08	
Isopentane		0.04	--	0																

**Van Hook Gathering Services, LLC
FBIR Compressor Station
Physical Properties**

Process Streams	Status:	Flow Rates & Composition Data																	
		Total Liquids to Tanks	Water	Wet Gas Analysis	1st Stage Compressor	1st Stage KO Inlet	1st Stage KO Outlet Gas	2nd Stage Compressed Gas	2nd Stage Fluids to 1st Stage	2nd Stage KO Fluids	2nd Stage KO Inlet	2nd Stage KO Outlet Gas	3rd Stage Fluids to Second Stage	3rd Stage KO Fluids	3rd Stage KO Inlet	Blowdown	Boilup	Condenser Fluids to Tanks	Dry Gas to Sales
Composition	Status:	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	
Phase: Total	Status: Block:	Tank Mixer Condensate	Tanks	SAT-1	SAT-1	1st Stage 1st Stage Mixer	1st Stage Knockout	2nd Stage	2nd Stage Mixer	Recycle 1st Stage	2nd State KO 2nd Stage	Stage Mixer	2nd State KO 3rd Stage	Recycle Second Stage	3rd Stage KO 3rd Stage	MKUP-1	Reboiler	Condenser	Contactor
	To Block:																		
Mole Fraction																			
CO2		3.87E-04	--	0.01	0.01	0.01	0.01	0.01	1.72E-03	1.72E-03	0.01	0.01	4.53E-03	4.53E-03	0.01	7.98E-05	0.04	0.01	
H2S		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
N2		3.13E-04	--	0.06	0.06	0.05	0.05	0.05	2.92E-03	2.92E-03	0.05	0.05	0.02	0.02	0.05	4.32E-11	2.88E-07	0.06	
Methane		0.01	--	0.53	0.53	0.47	0.48	0.48	0.07	0.07	0.45	0.50	0.27	0.27	0.50	1.97E-07	4.59E-04	0.54	
Ethane		0.03	--	0.20	0.20	0.19	0.19	0.19	0.12	0.12	0.20	0.21	0.22	0.22	0.21	1.25E-05	0.01	0.20	
Propane		0.07	--	0.13	0.13	0.14	0.14	0.14	0.21	0.21	0.15	0.15	0.24	0.24	0.15	7.60E-05	0.05	0.13	
Isobutane		0.02	--	0.01	0.01	0.02	0.02	0.02	0.04	0.04	0.02	0.01	0.03	0.03	0.01	9.60E-06	0.01	0.01	
n-Butane		0.10	--	0.04	0.04	0.06	0.06	0.06	0.19	0.19	0.06	0.05	0.12	0.12	0.05	1.30E-04	0.05	0.04	
Isopentane		0.04	--	0.01	0.01	0.01	0.01	0.01	0.06	0.06	0.01	0.01	0.02	0.02	0.01	5.87E-05	0.02	0.01	
n-Pentane		0.08	--	0.01	0.01	0.02	0.02	0.02	0.10	0.10	0.02	0.01	0.04	0.04	0.01	9.17E-05	0.03	0.01	
Cyclopentane		1.58E-04	--	1.00E-05	1.15E-05	3.13E-05	2.91E-05	2.91E-05	1.71E-04	1.71E-04	3.16E-05	1.42E-05	5.02E-05	5.02E-05	1.42E-05	2.23E-06	2.18E-04	8.73E-06	
n-Hexane		0.08	--	1.50E-03	2.10E-03	0.01	0.01	0.01	0.04	0.04	0.01	1.73E-03	0.01	0.01	1.73E-03	2.47E-05	0.01	8.50E-04	
Cyclohexane		0.01	--	1.85E-04	2.67E-04	8.68E-04	7.16E-04	7.16E-04	0.01	0.01	7.26E-04	1.80E-04	7.96E-04	7.96E-04	1.80E-04	1.93E-05	1.49E-03	8.54E-05	
i-C6		0.08	--	2.38E-03	3.15E-03	0.01	0.01	0.01	0.06	0.06	0.01	3.23E-03	0.01	0.01	3.23E-03	4.57E-05	0.01	1.72E-03	
n-Heptane		0.24	--	2.15E-03	1.83E-03	4.44E-03	3.00E-03	3.00E-03	0.02	0.02	2.89E-03	4.10E-04	2.06E-03	2.07E-03	4.10E-04	8.62E-06	1.21E-03	1.56E-04	
Methylcyclohexane		0.02	--	2.12E-04	1.84E-04	4.44E-04	2.98E-04	2.98E-04	2.27E-03	2.27E-03	2.87E-04	3.94E-05	2.00E-04	2.01E-04	3.94E-05	3.05E-06	2.09E-04	1.47E-05	
2,2,4-Trimethylpentane		0.02	--	2.14E-04	2.02E-04	5.01E-04	3.44E-04	3.44E-04	2.61E-03	2.61E-03	3.31E-04	4.75E-05	2.39E-04	4.75E-05	9.76E-07	1.35E-04	1.81E-05		
Benzene		4.35E-03	--	9.40E-05	1.26E-04	4.04E-04	3.48E-04	3.48E-04	2.37E-03	2.37E-03	3.61E-04	1.11E-04	4.57E-04	4.57E-04	1.11E-04	1.62E-04	2.93E-03	5.78E-05	
Toluene		4.68E-03	--	4.20E-05	3.62E-05	8.85E-05	6.02E-05	6.02E-05	4.57E-04	4.57E-04	5.80E-05	8.30E-06	4.20E-05	4.21E-05	8.30E-06	1.03E-05	1.20E-04	3.12E-06	
Ethylbenzene		1.20E-04	--	1.00E-06	2.83E-07	4.42E-07	1.97E-07	1.97E-07	1.56E-06	1.55E-06	1.82E-07	1.20E-08	6.93E-08	6.93E-08	1.20E-08	9.78E-09	8.78E-08	3.13E-09	
m-Xylene		1.81E-03	--	1.50E-05	3.90E-06	5.89E-06	2.51E-06	2.51E-06	2.51E-05	1.99E-05	1.97E-05	2.31E-06	1.41E-07	8.24E-07	8.23E-07	1.41E-07	1.05E-07	9.03E-07	3.63E-08
n-Octane		0.03	--	2.69E-04	6.99E-05	1.07E-04	4.70E-05	4.70E-05	3.72E-04	3.69E-04	4.34E-05	2.81E-06	1.62E-05	1.62E-05	2.81E-06	4.93E-08	4.86E-06	7.67E-07	
n-Nonane		0.01	--	8.10E-05	5.62E-06	6.29E-06	1.36E-06	1.36E-06	1.36E-05	1.08E-05	1.22E-06	3.07E-08	2.01E-07	1.97E-07	3.07E-08	4.18E-10	3.17E-08	5.19E-09	
n-Decane		1.08E-03	--	9.00E-06	1.96E-07	1.92E-07	1.94E-08	1.94E-08	1.59E-07	1.54E-07	1.73E-08	2.17E-10	1.51E-09	1.46E-09	2.17E-10	2.27E-12	1.18E-10	2.73E-11	
Water		0.14	1.00	--	2.36E-03	0.01	0.01	0.01	0.05	0.05	0.05	0.01	3.30E-03	0.02	0.02	3.30E-03	0.64	0.78	6.99E-04
TEG		--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.36	2.70E-04	6.22E-07	
Mass Flow		lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h
CO2		0.34	--	663.75	664.25	690.55	689.71	689.71	26.30	26.31	763.38	737.07	73.67	73.66	737.07	0.01	0.27	--	662.54
H2S		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
N2		0.18	--	3,775.81	3,776.36	3,804.77	3,804.05	3,804.05	28.41	28.42	3,976.79	3,948.38	172.75	172.70	3,948.38	3.02E-09	1.40E-06	--	3,775.46
Methane		3.46	--	20,862.80	20,870.65	21,277.31	21,266.00	21,266.00	406.67	406.76	22,869.83	22,463.08	1,603.84	1,603.49	22,463.08	7.87E-06	1.28E-03	--	20,856.34
Ethane		18.42	--	14,810.53	14,834.05	16,070.32	16,028.34	16,028.34	1,236.26	1,236.56	18,468.99	17,232.43	2,440.64	2,440.37	17,232.43	9.38E-04	0.06	--	14,787.58
Propane		66.52	--	14,005.65	14,066.73	17,337.02	17,209.35	17,209.35	3,270.29	3,271.10	21,111.02	17,839.92	3,901.67	3,901.21	17,839.92	0.01	0.36	--	13

Van Hook Gathering Services, LLC
 FBIR Compressor Station
 Physical Properties

Process Stream	Status	Flash Gas		Vapor from HP TEG		Lean Glycol		Lean Glycol to HP TEG		Makeup		Off-Gas		Vapor to Regenerator Bottoms		Regenerator		Rich Glycol		TEG to Net Gas	
		Solved	Flare	Flash Tank	HP TEG	From Reboiler	Pump	RCYL-1	MKUP-1	RCYL-1	Pump	RCYL-1	Flash Tank	RCYL-1	Bottoms	Regenerator	Vapor to Fuel Gas	Rich Glycol	From Contact Tower	Contact Tower	Net Gas
Composition	Block	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Phase: Total	To Block	Rich Flash	Rich Flash	Glycol Pump	Reboiler	RCYL-1	MKUP-1	Glycol Pump	MKUP-1	XFS3	MMSCFD	Regenerator	RTEX Condenser	Reboiler	Rich Flash	Glycol Contactor	XCHG-100	Glycol Contactor	XFS1	Glycol	Glycol
Std. Vapor Volumetric Flow		MMSCFD	MMSCFD	Regenerator	XCHG-100	RCYL-1	MKUP-1	Glycol Pump	MKUP-1	XFS3	MMSCFD	MMSCFD	MMSCFD	MMSCFD	MMSCFD	MMSCFD	MMSCFD	MMSCFD	MMSCFD	MMSCFD	MMSCFD
CO2		1.31E-04	5.94E-05	1.07E-05	9.76E-06	1.25E-05	1.07E-05	--	--	4.96E-05	6.54E-05	4.96E-05	1.90E-04	1.07E-05	0.14	--	--	--	--	--	--
H2S		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N2		6.82E-05	6.34E-07	--	4.45E-12	6.78E-12	--	--	--	6.34E-07	4.60E-10	6.34E-07	6.89E-05	--	--	--	--	--	--	1.23	
Methane		1.78E-03	6.56E-05	2.64E-08	2.04E-08	3.08E-08	2.64E-08	--	--	6.56E-05	7.48E-07	6.56E-05	1.85E-03	2.64E-08	11.84	--	--	--	--	--	--
Ethane		1.20E-03	1.53E-04	1.68E-06	1.33E-06	1.96E-06	1.68E-06	--	--	1.51E-04	2.02E-05	1.51E-04	1.36E-03	1.68E-06	4.48	--	--	--	--	--	--
Propane		8.47E-04	1.99E-04	1.02E-05	8.48E-06	1.19E-05	1.02E-05	--	--	1.90E-04	8.28E-05	1.90E-04	1.05E-03	1.02E-05	2.88	--	--	--	--	--	--
Isobutane		6.29E-05	1.74E-05	1.29E-06	1.09E-06	1.51E-06	1.29E-06	--	--	1.63E-05	9.75E-06	1.63E-05	8.03E-05	1.29E-06	0.27	--	--	--	--	--	--
n-Butane		2.42E-04	1.01E-04	1.74E-05	1.59E-05	2.03E-05	1.74E-05	--	--	8.51E-05	1.01E-04	8.51E-05	3.43E-04	1.74E-05	0.82	--	--	--	--	--	--
Isopentane		3.14E-05	2.21E-05	7.87E-06	7.93E-06	9.21E-06	7.87E-06	--	--	1.42E-05	3.75E-05	1.42E-05	5.35E-05	7.87E-06	0.12	--	--	--	--	--	--
n-Pentane		4.29E-05	3.20E-05	1.23E-05	1.26E-05	1.44E-05	1.23E-05	--	--	1.94E-05	5.41E-05	1.94E-05	7.49E-05	1.23E-05	0.16	--	--	--	--	--	--
Cyclopentane		1.01E-07	3.95E-07	2.99E-07	3.45E-07	3.50E-07	2.99E-07	--	--	5.02E-08	6.90E-07	5.02E-08	4.96E-07	2.99E-07	1.92E-04	--	--	--	--	--	--
n-Hexane		4.36E-06	5.79E-06	3.32E-06	3.67E-06	3.88E-06	3.32E-06	--	--	2.12E-06	1.18E-05	2.12E-06	1.02E-05	3.32E-06	0.02	--	--	--	--	--	--
Cyclohexane		6.74E-07	3.35E-06	2.59E-06	3.01E-06	3.03E-06	2.59E-06	--	--	3.32E-07	5.37E-06	3.32E-07	4.02E-06	2.59E-06	1.88E-03	--	--	--	--	--	--
i-C6		9.67E-06	1.14E-05	6.13E-06	6.70E-06	7.17E-06	6.13E-06	--	--	4.67E-06	2.27E-05	4.67E-06	2.10E-05	6.13E-06	0.04	--	--	--	--	--	--
n-Heptane		6.58E-07	1.66E-06	1.16E-06	1.34E-06	1.35E-06	1.16E-06	--	--	3.21E-07	3.26E-06	3.21E-07	2.32E-06	1.16E-06	3.44E-03	--	--	--	--	--	--
Methylcyclohexane		8.69E-08	5.23E-07	4.09E-07	4.81E-07	4.78E-07	4.09E-07	--	--	4.26E-08	8.11E-07	4.26E-08	6.10E-07	4.09E-07	3.24E-04	--	--	--	--	--	--
2,2,4-Trimethylpentane		7.28E-08	1.87E-07	1.31E-07	1.52E-07	1.53E-07	1.31E-07	--	--	3.55E-08	3.65E-07	3.55E-08	2.60E-07	1.31E-07	3.99E-04	--	--	--	--	--	--
Benzene		6.12E-07	2.59E-05	2.18E-05	2.56E-05	2.55E-05	2.18E-05	--	--	3.11E-07	3.02E-05	3.11E-07	2.65E-05	2.18E-05	1.28E-03	--	--	--	--	--	--
Toluene		2.18E-08	1.65E-06	1.39E-06	1.64E-06	1.62E-06	1.39E-06	--	--	1.10E-08	1.83E-06	1.10E-08	1.68E-06	1.39E-06	6.91E-05	--	--	--	--	--	--
Ethylbenzene		1.41E-11	1.58E-09	--	1.58E-09	1.53E-09	--	--	--	6.97E-12	1.72E-09	6.97E-12	1.60E-09	--	7.06E-08	--	--	--	--	--	--
m-Xylene		1.54E-10	1.71E-08	1.42E-08	1.70E-08	1.66E-08	1.42E-08	--	--	7.64E-11	1.85E-08	7.64E-11	1.73E-08	1.42E-08	8.02E-07	--	--	--	--	--	--
n-Octane		2.37E-09	8.98E-09	6.61E-09	7.84E-09	7.73E-09	6.61E-09	--	--	1.14E-09	1.55E-08	1.14E-09	1.14E-08	6.61E-09	1.69E-05	--	--	--	--	--	--
n-Nonane		1.06E-11	7.21E-11	--	6.70E-11	6.56E-11	--	--	--	5.09E-12	1.17E-10	5.09E-12	8.27E-11	--	1.14E-07	--	--	--	--	--	--
n-Decane		3.68E-14	3.79E-13	--	3.62E-13	3.56E-13	--	--	--	1.74E-14	5.49E-13	1.74E-14	4.16E-13	--	6.00E-10	--	--	--	--	--	--
Water		4.34E-05	0.10	0.09	0.10	0.10	0.09	--	--	2.33E-05	0.10	2.33E-05	0.10	0.09	0.03	--	--	--	--	--	--
TEG		1.79E-09	0.06	0.06	0.06	0.06	0.06	0.01	--	8.76E-10	0.06	8.76E-10	0.06	0.06	--	--	--	--	--	--	--
Mass Fraction																					
CO2		0.04	2.52E-04	4.67E-05	4.15E-05	5.33E-05	4.67E-05	--	--	0.09	2.77E-04	0.09	7.97E-04	4.67E-05	0.01	--	--	--	--	--	--
H2S		--	--	--	--	--	--	--	--	6.93E-04	1.24E-09	6.93E-04	1.84E-04	--	--	--	--	--	--	--	--
N2		0.01	1.71E-06	--	1.20E-11	1.84E-11	--	--	--	0.04	1.15E-06	0.04	2.82E-03	4.19E-08	0.33	--	--	--	--	--	--
Methane		0.21	1.01E-04	4.19E-08	3.16E-08	4.78E-08	4.19E-08	--	--	0.18	5.84E-05	0.18	3.88E-03	5.00E-06	0.23	--	--	--	--	--	--
Ethane		0.27	4.43E-04	5.00E-06	3.87E-06	5.7															

Van Hook Gathering Services, LLC
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 Physical Properties

Process Stream	Solved	Flash Gas		Vapor from HP TEG		Lean Glycol		Lean glycol to HP TEG		Makeup		Off Flash		Azeotrope to Regenerator		Regenerator		Rich Glycol		TEG to Net Gas	
		to Flare	Flash Tank	From Reboiler	Glycol Pump	Reboiler	RCYL-1	Solved	MKUP-1	---	---	Rich Flash	Regenerator	BTX	Bottoms	Report to Fuel Gas	from Contact Tower	Contact Tower	Net Gas		
Composition	Status	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved		
Phase: Total	To Block	Rich Flash	Rich Flash	Glycol Pump	Reboiler	RCYL-1	MKUP-1	Glycol Pump	MKUP-1	XFS3	Regenerator	BTX	Condenser	Reboiler	Rich Flash	Glycol Contactor	XCHG-100	Glycol Contactor	XFS1		
Mole Fraction																					
CO2		0.03	3.77E-04	7.52E-05	6.22E-05	7.98E-05	7.52E-05	--	--	0.08	4.13E-04	0.08	1.18E-03	7.52E-05	0.01						
H2S		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
N2		0.02	4.02E-06	--	--	2.84E-11	4.32E-11	1.97E-07	1.85E-07	--	--	1.02E-03	2.90E-09	1.02E-03	4.25E-04	--	--	--	0.06		
Methane		0.40	4.16E-04	1.85E-07	1.30E-07	1.97E-07	1.85E-07	--	--	0.11	4.72E-06	0.11	0.01	1.85E-07	0.54						
Ethane		0.27	9.69E-04	1.18E-05	8.48E-06	1.25E-05	1.18E-05	--	--	0.24	1.27E-04	0.24	0.01	1.18E-05	0.20						
Propane		0.19	1.26E-03	7.16E-05	5.40E-05	7.60E-05	7.16E-05	--	--	0.31	5.22E-04	0.31	0.01	7.16E-05	0.13						
Isobutane		0.01	1.11E-04	9.04E-06	6.95E-06	9.60E-06	9.04E-06	--	--	0.03	6.15E-05	0.03	4.96E-04	9.04E-06	0.01						
n-Butane		0.05	6.41E-04	1.22E-04	1.01E-04	1.30E-04	1.22E-04	--	--	0.14	6.40E-04	0.14	2.12E-03	1.22E-04	0.04						
Isopentane		0.01	1.40E-04	5.53E-05	5.05E-05	5.87E-05	5.53E-05	--	--	0.02	2.37E-04	0.02	3.30E-04	5.53E-05	0.01						
n-Pentane		0.01	2.03E-04	8.64E-05	8.03E-05	9.17E-05	8.64E-05	--	--	0.03	3.41E-04	0.03	4.62E-04	8.64E-05	0.01						
Cyclopentane		2.25E-05	2.51E-06	2.10E-06	2.20E-06	2.23E-06	2.10E-06	--	--	8.05E-05	4.35E-06	8.05E-05	3.06E-06	2.10E-06	8.73E-06						
n-Hexane		9.75E-04	3.68E-05	2.33E-05	2.34E-05	2.47E-05	2.33E-05	--	--	3.40E-03	7.46E-05	3.40E-03	6.26E-05	2.33E-05	8.49E-04						
Cyclohexane		1.51E-04	2.12E-05	1.82E-05	1.92E-05	1.93E-05	1.82E-05	--	--	5.33E-04	3.39E-05	5.33E-04	2.48E-05	1.82E-05	8.54E-05						
i-C6		2.16E-03	7.22E-05	4.30E-05	4.27E-05	4.57E-05	4.30E-05	--	--	0.01	1.43E-04	0.01	1.30E-04	4.30E-05	1.72E-03						
n-Heptane		1.47E-04	1.05E-05	8.12E-06	8.53E-06	8.62E-06	8.12E-06	--	--	5.14E-04	2.05E-05	5.14E-04	1.43E-05	8.12E-06	1.56E-04						
Methylcyclohexane		1.94E-05	3.32E-06	2.87E-06	3.06E-06	3.05E-06	2.87E-06	--	--	6.83E-05	5.12E-06	6.83E-05	3.77E-06	2.87E-06	1.47E-05						
2,2,4-Trimethylpentane		1.63E-05	1.19E-06	9.20E-07	9.66E-07	9.76E-07	9.20E-07	--	--	5.68E-05	2.31E-06	5.68E-05	1.60E-06	9.20E-07	1.81E-05						
Benzene		1.37E-04	1.64E-04	1.53E-04	1.63E-04	1.62E-04	1.53E-04	--	--	4.98E-04	1.90E-04	4.98E-04	1.63E-04	1.53E-04	5.80E-05						
Toluene		4.88E-06	1.05E-05	9.74E-06	1.05E-05	1.03E-05	9.74E-06	--	--	1.76E-05	1.16E-05	1.76E-05	1.03E-05	9.74E-06	3.14E-06						
Ethylbenzene		3.14E-09	1.01E-08	--	1.00E-08	9.78E-09	--	--	--	1.12E-08	1.08E-08	1.12E-08	9.86E-09	--	3.20E-09						
m-Xylene		3.45E-08	1.09E-07	9.94E-08	1.08E-07	1.05E-07	9.94E-08	--	--	1.22E-07	1.16E-07	1.22E-07	1.06E-07	9.94E-08	3.64E-08						
n-Octane		5.31E-07	5.70E-08	4.64E-08	5.00E-08	4.93E-08	4.64E-08	--	--	1.82E-06	9.80E-08	1.82E-06	7.01E-08	4.64E-08	7.66E-07						
n-Nonane		2.38E-09	4.57E-10	--	4.27E-10	4.18E-10	--	--	--	8.15E-09	7.39E-10	8.15E-09	5.10E-10	--	5.19E-09						
n-Decane		8.23E-12	2.41E-12	--	2.31E-12	2.27E-12	--	--	--	2.79E-11	3.47E-12	2.79E-11	2.57E-12	--	2.73E-11						
Water		0.01	0.63	0.60	0.64	0.64	0.60	--	--	0.04	0.64	0.04	0.62	0.60	1.36E-03						
TEG		4.00E-07	0.36	0.40	0.36	0.36	0.40	1.00	--	1.40E-06	0.36	1.40E-06	0.35	0.40	--						
Mass Flow		lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	
CO2		0.63	0.29	0.05	0.05	0.06	0.05	--	--	0.24	0.32	0.24	0.92	0.05	663.41						
H2S		--	--	--	--	--	--	--	--	--	--	--	--	--	--						
N2		0.21	1.95E-03	--	1.37E-08	2.09E-08	--	--	--	1.95E-03	1.42E-06	1.95E-03	0.21	--	3,775.68						
Methane		3.14	0.12	4.65E-05	3.59E-05	5.43E-05	4.65E-05	--	--	0.12	1.32E-03	0.12	3.25	4.65E-05	20,859.59						
Ethane		3.97	0.50	0.01	4.39E-03	0.01	0.01	--	--	0.50	0.07	0.50	4.48	0.01	14,792.06						
Propane		4.10	0.96	0.05	0.04	0.06	0.05	--	--	0.92	0.40	0.92	5.06	0.05	13,938.71						
Isobutane		0.40	0.11	0.01	0.01	0.01	0.01	--	--	0.10	0.06	0.10	0.51	0.01	1,719.22						
n-Butane		1.55	0.64	0.11	0.10	0.13	0.11	--	--	0.54	0.65	0.54	2.19	0.11	5,246.93						
Isopentane		0.25	0.17	0.06	0.06	0.07	0.06	--	--	0.11	0.30	0.11	0.42	0.06	929.31						

Van Hook Gathering Services, LLC
FBIR Compressor Station
Fugitive Emissions

Background Information

Total fugitive component counts are based on equipment counts at the facility and default average component counts for major crude oil production equipment (40 CFR Part 98, Subpart W, Table W-1C) and major onshore natural gas production equipment (40 CFR Part 98, Subpart W, Table W-1B). Since both light oil and gas components are present at the facility, the emissions assume the maximum component emission factor.

Emissions Estimate

Liquid Equipment/Service	Oil and Gas Production Operations Emission Factor ^a (Light Oil)	Oil and Gas Production Operations Emission Factor ^a (Gas)	# Light Oil Components	# Gas Components	Short-Term TOC Emissions ^b (lb/hr)	Annual TOC Emissions ^c (ton/yr)
	(lb TOC/hr/component)	(lb TOC/hr/component)				
Valves	0.0055	0.00992	29	367	3.80	16.64
Flanges	0.000243	0.00086	58	0	0.01	0.06
Open-Ended Lines	0.00309	0.00441	0	27	0.12	0.52
Connectors	0.000463	0.00044	44	1043	0.48	2.10
Other	0.0165	0.0194	0	22	0.43	1.87
Total					4.84	21.20

^a Emission factors are for oil and gas production facilities (not refineries) come from the EPA's "Protocol for Equipment Leak Emission Estimates" November 1995, EPA 4531, R-95-017, Table 2-4. These factors are referenced in Appendix A, Ch. 6, Sec. 2 Permitting Guidance for Oil and Gas Facilities.

^b Controlled Short-Term ER (lb/hr) = (100% - Reduction Factor) * Σ(Number of Components * Emissions Factor [lb/hr/component]).

^c Controlled Annual ER (tpy) = Controlled Short-Term ER (lb/hr) * 8,760 (hr/yr) / 2,000 (lb/ton).

Speciated Fugitive Emissions^a

Component	Light Oil (lb/hr)	Light Oil (ton/year)	Gas (lb/hr)	Gas (ton/year)	Total (lb/hr)	Total (ton/year)
CO2	6.14E-06	2.69E-05	0.08	0.35	0.08	0.35
H2S	--	--	--	--	--	--
N2	3.19E-07	1.40E-06	0.46	2.00	0.46	2.00
Methane	2.14E-05	9.38E-05	2.52	11.03	2.52	11.03
Ethane	6.76E-04	2.96E-03	1.79	7.82	1.79	7.82
Propane	0.01	0.02	1.68	7.37	1.69	7.39
Isobutane	2.76E-03	0.01	0.21	0.91	0.21	0.92
n-Butane	0.01	0.06	0.63	2.77	0.65	2.84
Isopentane	0.01	0.03	0.11	0.49	0.12	0.53
n-Pentane	0.02	0.07	0.15	0.66	0.17	0.73
Cyclopentane	3.19E-05	1.40E-04	1.79E-04	7.83E-04	2.11E-04	9.22E-04
n-Hexane	0.02	0.09	0.02	0.09	0.04	0.18
Cyclohexane	2.97E-03	0.01	2.10E-03	0.01	0.01	0.02
i-C6	0.02	0.09	0.04	0.19	0.06	0.28
n-Heptane	0.07	0.31	4.57E-03	0.02	0.08	0.33
Methylcyclohexane	0.01	0.03	4.22E-04	1.85E-03	0.01	0.03
2,2,4-Trimethylpentane	0.01	0.03	6.04E-04	2.65E-03	0.01	0.04
Benzene	9.98E-04	4.37E-03	1.32E-03	0.01	2.32E-03	0.01
Toluene	1.28E-03	0.01	8.40E-05	3.68E-04	1.36E-03	0.01
Ethylbenzene	3.79E-05	1.66E-04	9.71E-08	4.25E-07	3.80E-05	1.67E-04
m-Xylene	5.69E-04	2.49E-03	1.12E-06	4.92E-06	5.71E-04	2.50E-03
n-Octane	0.01	0.05	2.56E-05	1.12E-04	0.01	0.05
n-Nonane	3.72E-03	0.02	1.94E-07	8.51E-07	3.72E-03	0.02
n-Decane	4.59E-04	2.01E-03	1.13E-09	4.96E-09	4.59E-04	2.01E-03
Water	0.01	0.03	3.67E-03	0.02	0.01	0.05
TEG	--	--	2.72E-05	1.19E-04	2.72E-05	1.19E-04
Total	0.20	0.88	7.70	33.74	7.90	34.62
Total CO₂	6.14E-06	2.69E-05	0.08	0.35	0.08	0.35
Total Methane	2.14E-05	9.38E-05	2.52	11.03	2.52	11.03
Total CO₂e	5.42E-04	2.37E-03	63.04	276.13	63.04	276.13
TOC	0.19	0.85	7.16	31.38	7.36	32.23
VOC	0.19	0.85	2.86	12.53	3.05	13.37
Total HAP	0.03	0.13	0.02	0.10	0.05	0.24

^a Fugitive oil emissions speciation is based on the Condensate Sales Stream. Fugitive gas emissions speciation is based on the Dry Gas to Sales Stream.

Van Hook Gathering Services, LLC
FBIR Compressor Station
Gas Compressor Engines

Engine Data	
Name	Compressor Engines (Each)
Equipment ID	C-1 - C-3
Manufacturer	Caterpillar
Model Number	G3606LE
Horsepower:	1,775
Fuel consumption (Btu/hp-hr):	6,826
Hours of operation per year:	8,760
Engine Type:	4 Stroke, Lean-Burn

Fuel Data	
Fuel Type	field gas
Fuel Consumption (BTU/bhp-hr)	6,826.00
Heat Value (HHV)	1,458.11
Heat Value (LHV)	1,329.73
Sulfur Content (grains/100scf) ^a	0.24

^a Sulfur content based definition of sour gas from AP-42 Section 5.3

METHOD OF EMISSION CONTROL	Yes/No
NSCR Catalyst	No
SCR Catalyst	No
JLCC Catalyst	No
Parameter Adjustment	No
Stratified Charge	No
Other (Specify)	Oxydation Catalyst

Emission Calculations			Compressor Engines (Each)				
	Manufacturer's emission factors (g/hp-hr)	AP-42 Table 3.2-2 4 stroke, lean-burn engine emission factors (lb/MMBtu)	Controlled Emission Factors ^d (g/hp-hr)	Emission Factor Used	Units	Emissions (lb/hr)	Emissions (tpy)
VOC ^b	1.11	0.118	0.50	0.5	g/hp-hr	2.47	10.80
NOx	0.50	4.08	1.50	1.5	g/hp-hr	5.87	25.71
CO	2.76	0.317	0.24	0.24	g/hp-hr	0.94	4.11
PM ₁₀		0.0099871		0.0099871	lb/MMBtu	0.12	0.53
PM _{2.5}		0.0099871		0.0099871	lb/MMBtu	0.12	0.53
SO ₂		0.000588		0.000588	lb/MMBtu	0.01	0.02
Formaldehyde	0.26	0.0528	0.13	0.13	g/hp-hr	0.51	2.23
Benzene		0.000404		0.000404	lb/MMBtu	4.89E-03	0.02
H ₂ S		N/A		98% DRE	N/A	5.70E-05	2.50E-04
CO ₂		110		110	lb/MMBtu	1,332.78	5,837.56
Methane		1.25		1.25	lb/MMBtu	15.15	66.34
N ₂ O ^c		N/A		0.000441	lb/MMBtu	0.01	0.02
CO _{2e}		N/A		N/A	N/A	1,713.00	7,502.93

^a Controlled emissions based on a requested enforceable limit.

^b VOC Emissions include Formaldehyde.

^c N₂O emissions factor from EPA Emissions Factors for Greenhouse Gas Inventories, March 2018

Van Hook Gathering Services, LLC
FBIR Compressor Station
Gas Compressor Engines

Calculation:

For emission factors in terms of g/hp-hr:

$$(\text{Emission factor}) * (\text{Horsepower}) / (\text{Conversion factor})$$

$$(g/\text{hp-hr}) * (\text{hp}) / (453.59 \text{ g/lb})$$

For emission factors in terms of lb/MMBtu:

$$(\text{Emission factor}) * (\text{Fuel Consumption}) * (\text{Horsepower}) * (\text{Conversion factor})$$

$$(\text{lb/MMBtu}) * (\text{Btu/hp-hr}) * (\text{hp}) * (1 \text{ MMBtu}/1,000,000 \text{ Btu})$$

HAP Emission Calculations Pollutant	4 Stroke, Lean-Burn	Compressor Engines (Each)	
	AP-42 Table 3.2-2 Emission Factor (lb/MMBtu)	Emissions lb/hr	Emissions tpy
1,1,2,2-Tetrachloroethane	4.00E-05	4.85E-04	2.12E-03
1,1,2-Trichloroethane	3.18E-05	3.85E-04	1.69E-03
1,3-Butadiene	2.67E-04	3.24E-03	0.01
1,3-Dichloropropene	2.64E-05	3.20E-04	1.40E-03
2-Methylnaphthalene	3.32E-05	4.02E-04	1.76E-03
2,2,4-Trimethylpentane	2.50E-04	3.03E-03	0.01
Acenaphthene	1.25E-06	1.51E-05	6.63E-05
Acenaphthylene	5.53E-06	6.70E-05	2.93E-04
Acetaldehyde	0.01	0.10	0.44
Acrolein	0.01	0.06	0.27
Benzene	4.40E-04	0.01	0.02
Benzo(b)fluanthene	1.66E-07	2.01E-06	8.81E-06
Benzo(e)pyrene	4.15E-07	5.03E-06	2.20E-05
Benzo(g,h,i)perylene	4.14E-07	5.02E-06	2.20E-05
Biphenyl	2.12E-04	2.57E-03	0.01
Carbon Tetrachloride	3.67E-05	4.45E-04	1.95E-03
Chlorobenzene	3.04E-05	3.68E-04	1.61E-03
Chloroform	2.85E-05	3.45E-04	1.51E-03
Chrysene	6.93E-07	8.40E-06	3.68E-05
Ethylbenzene	3.97E-05	4.81E-04	2.11E-03
Ethylene Dibromide	4.43E-05	5.37E-04	2.35E-03
Flouranthene	1.11E-06	1.34E-05	5.89E-05
Flourene	5.67E-06	6.87E-05	3.01E-04
Formaldehyde	engine specific	0.51	2.23
Methanol	2.50E-03	0.03	0.13
Methylene Chloride	2.00E-05	2.42E-04	1.06E-03
n-Hexane	1.11E-03	0.01	0.06
Naphthalene	7.44E-05	9.01E-04	3.95E-03
PAH	2.69E-05	3.26E-04	1.43E-03
Phenanthrene	1.04E-05	1.26E-04	5.52E-04
Phenol	2.40E-05	2.91E-04	1.27E-03
Pyrene	1.36E-06	1.65E-05	7.22E-05
Styrene	2.36E-05	2.86E-04	1.25E-03
Tetrachloroethane	2.48E-06	3.00E-05	1.32E-04
Toluene	4.08E-04	4.94E-03	0.02
Vinyl Chloride	1.49E-05	1.81E-04	7.91E-04
Xylene	1.84E-04	2.23E-03	0.01
Total HAPs		0.74	3.26

**Van Hook Gathering Services, LLC
FBIR Compressor Station
Condensate Tanks**

General Information		
Vessel		
Emission Source	Condensate Tanks (Each)	
Equipment ID	TK-1 - TK-4	
Throughput (BPD)	35	
Throughput (BPY)	12,775	
Tank Dimensions		
Shell Height (ft)	20.0	
Diameter (ft)	12.0	
Volume (gal)	16,800	
Other Inputs		
Shell & Roof Color/Shade ^a	Dark Green	
Shell & Roof Condition	Good	
Meteorological Data	Bismarck, ND	
Controlled?	Yes	
Control Equipment	Enclosed Combustor	
Tank Contents		
Condensate RVP	18.80	
Total Uncontrolled Plant VOC Emissions ^b		
VOC Flashing Losses (ton/yr)	292.60	
VOC Working & Breathing Losses (ton/yr)	17.86	
Total VOC Losses (ton/yr)	310.46	

Notes

^a Dark Green paint color selected in ProMax options to simulate Dark Green paint.

^b From ProMax AP-42 Emissions Report

Uncontrolled Condensate Tank Emissions

Component	Condensate Tanks (Each)				Total (TPY)		
	Flashing (lb/hr)	Working and Breathing (lb/hr)	Total (lb/hr)	Flashing (TPY)	Working and Breathing (TPY)	Total (TPY)	
CO2	0.08	1.31E-03	0.08	0.33	0.01	0.34	
H2S	--	--	--	--	--	--	
N2	0.04	7.30E-06	0.04	0.19	3.20E-05	0.19	
Methane	0.84	1.98E-03	0.85	3.63	0.01	3.64	
Ethane	3.94	0.16	4.09	15.14	0.68	15.82	
Propane	10.42	0.40	10.81	32.15	1.74	33.89	
Isobutane	2.28	0.08	2.36	5.62	0.35	5.97	
n-Butane	8.27	0.28	8.55	18.77	1.25	20.02	
Isopentane	2.02	0.06	2.08	3.95	0.25	4.21	
n-Pentane	3.02	0.09	3.11	5.67	0.37	6.04	
Cyclopentane	4.20E-03	1.04E-04	4.30E-03	0.01	4.56E-04	0.01	
n-Hexane	1.08	0.03	1.11	1.77	0.13	1.89	
Cyclohexane	0.13	2.76E-03	0.13	0.22	0.01	0.23	
i-C6	1.53	0.04	1.57	2.62	0.19	2.81	
n-Heptane	1.17	0.03	1.20	1.77	0.13	1.90	
Methylcyclohexane	0.12	2.89E-03	0.12	0.18	0.01	0.19	
2,2,4-Trimethylpentane	0.14	3.61E-03	0.15	0.22	0.02	0.24	
Benzene	0.06	8.88E-04	0.06	0.09	3.89E-03	0.10	
Toluene	0.02	3.15E-04	0.02	0.03	1.38E-03	0.03	
Ethylbenzene	2.05E-04	3.00E-06	2.08E-04	2.91E-04	1.31E-05	3.04E-04	
m-Xylene	2.84E-03	5.38E-05	2.89E-03	4.01E-03	2.36E-04	4.25E-03	
n-Octane	0.05	1.26E-03	0.06	0.08	0.01	0.08	
n-Nonane	0.01	1.20E-04	0.01	0.01	5.26E-04	0.01	
n-Decane	2.19E-04	4.21E-06	2.24E-04	2.64E-04	1.85E-05	2.83E-04	
Water	0.30	1.35E-03	0.30	0.42	0.01	0.43	
TEG	--	--	--	--	--	--	
Total	35.52	1.18	36.70	92.87	5.16	98.03	
Total CO2	0.08	1.31E-03	0.08	0.33	0.01	0.34	
Total Methane	0.84	1.98E-03	0.85	3.63	0.01	3.64	
Total CO₂e	21.18	0.05	21.23	91.09	0.22	91.31	
Total VOC	30.31	1.02	31.33	73.15	4.47	77.61	
Total HAP	1.30	0.03	1.34	2.12	0.15	2.27	

Van Hook Gathering Services, LLC
 FBIR Compressor Station
 Condensate Loading

Oil RVP ^a	18.80	psia
Oil Antoine Const. A	9.98	dimensionless
Oil Antoine Const. B	3693	°R

Hourly	
Saturation Factor, S ^b	0.6
Number of Loading Arms	1
Percent Reduction (%)	0
Max True Vapor Pressure, P ^c (psia)	27.870
Molecular Weight of Vapors, M ^a (lb/lb-mol)	49.3
Temp of Loaded Liquid, T (°F)	95
Emission Factor ^b (lb/10 ³ gal)	18.50
Estimated Hourly Throughput ^d (gal/hr)	8,000
Total Uncontrolled Hourly Total Gas Emissions ^e (lb/hr)	147.98
Capture Efficiency (%)	98.7%
Loading Fugitive Hourly Total Gas Emissions ^f (lb/hr)	1.92
Maximum Annual Total Gas to Control Device ^g (lb/hr)	146.06

Annual	
Saturation Factor, S ^b	0.6
Number of Loading Arms	1
Percent Reduction (%)	0
Max True Vapor Pressure, P ^c (psia)	14.618
Molecular Weight of Vapors, M ^a (lb/lb-mol)	49.3
Temp of Loaded Liquid, T (°F)	46
Emission Factor ^b (lb/10 ³ gal)	10.64
Estimated Annual Throughput ^d (gal/yr)	2,146,200
Total Uncontrolled Annual Total Gas Emissions ^e (tpy)	11.42
Capture Efficiency (%)	98.7%
Loading Fugitive Annual Total Gas Emissions ^f (tpy)	0.15
Maximum Annual Total Gas to Control Device ^g (tpy)	11.27

^a Estimated by ProMax.

^b Per AP-42, 5th Edition (6/08), Section 5.2, Equation 1

$$\text{Emission Factor (lb/10}^3\text{gal)} = \frac{\text{S} \times \text{P} \times \text{M} \times 12.46}{\text{T} + 460}$$

Saturation Factor = 0.6 for submerged loading, dedicated normal service

^c Based on oil Antoine Coefficients at temperature loaded

^d Assumes oil can be loaded at a maximum of 8,000 gal/hour per truck

^e Hourly Emissions (lb/hr) = Hourly Throughput (gal/hr) / 1000 x Emission Factor (lb/10³ gal) * (100% - Percent Reduction (%)).

^f Maximum Hourly Emissions (lb/hr) = Uncontrolled Hourly Emissions (lb/hr) x (100% - 98.7% capture efficiency)

^g Maximum Hourly Total Gas to Control (lb/hr) = Uncontrolled Hourly Emissions (lb/hr) x 98.7% capture efficiency.

Van Hook Gathering Services, LLC
 FBIR Compressor Station
 Condensate Loading

Speciated Loading Emissions

VOC to Control Device (EPN EC-1)

Component	lb/hr	ton/year
CO2	0.16	0.01
H2S	--	--
N2	9.05E-04	6.98E-05
Methane	0.25	0.02
Ethane	19.21	1.48
Propane	49.34	3.81
Isobutane	9.92	0.77
n-Butane	35.28	2.72
Isopentane	7.15	0.55
n-Pentane	10.60	0.82
Cyclopentane	0.01	9.95E-04
n-Hexane	3.63	0.28
Cyclohexane	0.34	0.03
i-C6	5.27	0.41
n-Heptane	3.58	0.28
Methylcyclohexane	0.36	0.03
2,2,4-Trimethylpentane	0.45	0.03
Benzene	0.11	0.01
Toluene	0.04	3.01E-03
Ethylbenzene	3.71E-04	2.86E-05
m-Xylene	0.01	5.15E-04
n-Octane	0.16	0.01
n-Nonane	0.01	1.15E-03
n-Decane	5.22E-04	4.03E-05
Water	0.17	0.01
TEG	--	--
Total	146.06	11.27
Total CO2	0.16	0.01
Total Methane	0.25	0.02
Total CO₂e	6.29	0.49
Total VOC	126.27	9.74
Total HAP	4.23	0.33

Loading Fugitive VOC Emissions

Component	lb/hr	ton/year
CO2	2.14E-03	1.65E-04
H2S	--	--
N2	1.19E-05	9.20E-07
Methane	3.23E-03	2.49E-04
Ethane	0.25	0.02
Propane	0.65	0.05
Isobutane	0.13	0.01
n-Butane	0.46	0.04
Isopentane	0.09	0.01
n-Pentane	0.14	0.01
Cyclopentane	1.70E-04	1.31E-05
n-Hexane	0.05	3.69E-03
Cyclohexane	4.50E-03	3.47E-04
i-C6	0.07	0.01
n-Heptane	0.05	3.64E-03
Methylcyclohexane	4.71E-03	3.64E-04
2,2,4-Trimethylpentane	0.01	4.54E-04
Benzene	1.45E-03	1.12E-04
Toluene	5.14E-04	3.97E-05
Ethylbenzene	4.89E-06	3.77E-07
m-Xylene	8.78E-05	6.78E-06
n-Octane	2.05E-03	1.58E-04
n-Nonane	1.96E-04	1.51E-05
n-Decane	6.87E-06	5.30E-07
Water	2.21E-03	1.71E-04
TEG	--	--
Total	1.92	0.15
Total CO2	2.14E-03	1.65E-04
Total Methane	3.23E-03	2.49E-04
Total CO₂e	0.08	0.01
Total VOC	1.66	0.13
Total HAP	0.06	4.30E-03

Van Hook Gathering Services, LLC
FBIR Compressor Station
TEG Dehydration Unit

Background Information	
Equipment ID	DHY-1
Throughput (MMscfd):	22.00
Operation (hr/yr):	8,760
Wet Gas Temperature (°F):	110.00
Wet Gas Pressure (psig):	1,150.00
Wet Gas Water Content:	Saturated
Lean Glycol Type:	TEG
Glycol Pump Type:	Electric Pump
Flash Tank Temperature (°F):	100.00
Flash Tank Pressure (psig):	40.00
Flash Tank Control	Routed to Enclosed Combustor
Regenerator Control	Routed to Condenser + reboiler fuel

Component	Uncontrolled Flash Tank Emissions ^a	Uncontrolled Regenerator Emissions ^a	Uncontrolled Glycol Dehydrator Emissions	
	lb/hr	lb/hr	lb/hr	ton/yr
CO2	0.63	0.24	0.87	3.82
H2S	--	--	--	--
N2	0.21	1.95E-03	0.21	0.93
Methane	3.14	0.12	3.25	14.25
Ethane	3.97	0.50	4.47	19.59
Propane	4.10	0.92	5.02	22.00
Isobutane	0.40	0.10	0.51	2.21
n-Butane	1.55	0.54	2.09	9.15
Isopentane	0.25	0.11	0.36	1.58
n-Pentane	0.34	0.15	0.49	2.16
Cyclopentane	7.74E-04	3.87E-04	1.16E-03	0.01
n-Hexane	0.04	0.02	0.06	0.27
Cyclohexane	0.01	3.07E-03	0.01	0.04
i-C6	0.09	0.04	0.14	0.59
n-Heptane	0.01	3.53E-03	0.01	0.05
Methylcyclohexane	9.37E-04	4.59E-04	1.40E-03	0.01
2,2,4-Trimethylpentane	9.13E-04	4.45E-04	1.36E-03	0.01
Benzene	0.01	2.66E-03	0.01	0.03
Toluene	2.21E-04	1.11E-04	3.32E-04	1.45E-03
Ethylbenzene	1.64E-07	8.12E-08	2.45E-07	1.07E-06
m-Xylene	1.80E-06	8.91E-07	2.69E-06	1.18E-05
n-Octane	2.98E-05	1.43E-05	4.40E-05	1.93E-04
n-Nonane	1.50E-07	7.16E-08	2.21E-07	9.70E-07
n-Decane	5.75E-10	2.72E-10	8.47E-10	3.71E-09
Water	0.09	0.05	0.13	0.58
TEG	2.95E-05	1.44E-05	4.39E-05	1.92E-04
Total	14.83	2.81	17.64	77.28
Total CO2	0.63	0.24	0.87	3.82
Total Methane	3.14	0.12	3.25	14.25
Total CO₂e	79.08	3.13	82.20	360.05
Total VOC	6.79	1.91	8.70	38.11
Total HAP	0.05	0.02	0.07	0.31

^a Uncontrolled emissions determined via ProMax

Demonstration of MACT RH Applicability	
Maximum Daily Throughput:	22.00 MMscfd
	622,970.6 m ³ /day
Actual Annual Benzene Emissions:	0.03 tpy
	0.03 Mg/yr

The unit is a large glycol dehydration unit at an area source of HAPs. The unit is exempt from the requirements of 40 CFR 63.764(d) because the annual average emissions of benzene from the unit process vent are less than 0.9 Mg per year.

Van Hook Gathering Services, LLC
FBIR Compressor Station
TEG Reboiler Heater - Natural Gas

Background Information	
Name	TEG Reboiler Heater
Equipment ID:	R-1
Heater/Boiler rating (MMBtu/hr):	0.5
Rating above is:	below 100 MMBtu/hr, uncontrolled
Operating hours/year:	8760
Natural Gas Heat Value (Btu/scf) ^a :	1020
Regenerator Overheads Heat Value (Btu/scf):	2,111
Fuel Rate (scf/hr):	237
Fuel Rate (scf/yr):	2,074,881

^a Heating value for natural gas taken from Section 1.4 of AP-42 (dated 7/98).

^b Heating value for regenerator overheads calculated by ProMax.

Pollutant	Emission Factor ^b (lb/MMscf)	lb/hr	tpy
VOC	5.5	5.58E-03	2.44E-02
NOx	100	1.01E-01	4.44E-01
CO	84	8.52E-02	3.73E-01
PM ₁₀	7.6	7.71E-03	3.38E-02
PM _{2.5}	7.6	7.71E-03	3.38E-02
SO ₂	0.6	6.09E-04	2.67E-03
HAPs			
Arsenic	0.0002	2.03E-07	8.89E-07
Benzene	0.0021	2.13E-06	9.33E-06
Beryllium	0.000012	1.22E-08	5.33E-08
Cadmium	0.0011	1.12E-06	4.89E-06
Chromium	0.0014	1.42E-06	6.22E-06
Cobalt	0.000084	8.52E-08	3.73E-07
Dichlorobenzene	0.0012	1.22E-06	5.33E-06
Formaldehyde	0.075	7.61E-05	3.33E-04
n-Hexane	1.8	1.83E-03	8.00E-03
Lead	0.0005	5.07E-07	2.22E-06
Manganese	0.00038	3.86E-07	1.69E-06
Mercury	0.00026	2.64E-07	1.16E-06
Naphthalene	0.00061	6.19E-07	2.71E-06
Nickel	0.0021	2.13E-06	9.33E-06
POM	0.000088	8.93E-08	3.91E-07
Toluene	0.0034	3.45E-06	1.51E-05
Selenium	0.000024	2.43E-08	1.07E-07
Total HAPs		1.92E-03	8.39E-03
Other Pollutants			
H ₂ S	N/A ^c	1.56E-06	6.83E-06

^a Emission factors are taken from AP-42, Chapter 1, Tables 1.4-1, 1.4-2, 1.4-3, and 1.4-4, dated July 1998.

^b H₂S emissions are conservatively based on 98% conversion of H₂S to SO₂.

^c Greenhouse Gas Factors from AP-42, Table 1.4.2 Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion.

^d Global Warming Potentials from Table A-1 of Subpart A of Part 98 for Mandatory Greenhouse Gas Reporting.

Parameter	Value
scf/lbmole	379.3
Btu/MMBtu	1,000,000
scf/MMscf	1,000,000
lb/ton	2,000
H ₂ S MW	34.08
SO ₂ MW	64.06

GHG Pollutant Emissions ^d	
GHG CO ₂ Factor:	120,000 lb/MMscf
GHG CH ₄ Factor:	2.3 lb/MMscf
GHG N ₂ O Factor:	2.2 lb/MMscf
GWP CO ₂ Equivalent:	1
GWP CH ₄ Equivalent:	25
GWP N ₂ O Equivalent:	298
CO ₂ emissions:	124.49 tpy
CH ₄ emissions:	2.39E-03 tpy
N ₂ O emissions:	2.28E-03 tpy
CO _{2e} emissions:	125.23 tpy

H ₂ S Max Concentration ^b (ppmv)	H ₂ S Mass to Reboiler ^a (lb/hr)	H ₂ S Mass to Reboiler ^a (tpy)
3.66	7.79E-05	3.41E-04

^a H₂S Mass to Reboiler (lb/hr) = H₂S Max Concentration (ppmv) /10⁶ * Fuel Rate (scf/hr) / Standard Molar Volume (scf/lbmol) * H₂S

^b Sulfur content based definition of sour gas from AP-42 Section 5.3

Example Calculation (VOC):

EMISSION FACTOR	HEATER RATING / HEAT VALUE	HOURLY EMISSIONS	ANNUAL OPERATING HOURS	WEIGHT CONVERSION	ANNUAL EMISSIONS
5.5 lb VOC MMscf Natural Gas Burned	x 0.5 MMBtu/hr 1020 Btu/scf	= 0.006 lb VOC hr	x 8,760 hours yr	x 1 ton 2,000 lbs	= 0.024 tons VOC yr

Criteria Pollutant Emission Factors obtained from AP-42 Nat Gas Combustion, Table 1.4-1, (7/98) < 100 MMBtu/hr heat input; & Table 1.4-2, (7/98).

Van Hook Gathering Services, LLC
 FBIR Compressor Station
 Flare - Hourly

Flare Feed Rates and Composition ^{a,b}					Flare DRE% ^c (%)	Flare Exhaust Components ^d (lb/hr)	Criteria Pollutant Emissions ^e
Component	Pilot (lb/hr)	Gas Sales Line Downtime (lb/hr)	MSS- Compressor Blowdowns (lb/hr)	Total ^b (lb/hr)			
CO2	0.04	664.25	1.63	665.92	0%	665.92	NO _x factor: 0.0680 lb/MMBtu
H2S	--	--	--	--	98%	--	CO factor: 0.3700 lb/MMBtu
N2	0.21	3,776.36	9.01	3,785.57	0%	3,785.57	PM ₁₀ factor: 7.60 lb/MMscf
Methane	1.14	20,870.65	50.35	20,922.14	99%	209.22	PM _{2.5} factor: 7.60 lb/MMscf
Ethane	0.81	14,834.05	37.95	14,872.81	99%	148.73	
Propane	0.76	14,066.73	40.75	14,108.24	99%	141.08	
Isobutane	0.09	1,762.54	6.17	1,768.80	98%	35.38	
n-Butane	0.29	5,460.88	21.55	5,482.72	98%	109.65	
Isopentane	0.05	1,047.99	5.77	1,053.80	98%	21.08	
n-Pentane	0.07	1,479.57	9.00	1,488.64	98%	29.77	
Cyclopentane	8.07E-05	1.97	0.01	1.98	98%	0.04	
n-Hexane	0.01	443.71	3.43	447.15	98%	8.94	
Cyclohexane	9.48E-04	54.90	0.39	55.30	98%	1.11	
i-C6	0.02	664.24	5.18	669.44	98%	13.39	
n-Heptane	2.06E-03	449.04	1.97	451.01	98%	9.02	
Methylcyclohexane	1.91E-04	44.34	0.19	44.53	98%	0.89	
2,2,4-Trimethylpentane	2.73E-04	56.35	0.26	56.60	98%	1.13	
Benzene	5.95E-04	24.02	0.18	24.20	98%	0.48	
Toluene	3.80E-05	8.17	0.04	8.20	98%	0.16	
Ethylbenzene	4.39E-08	0.07	1.37E-04	0.07	98%	1.47E-03	
m-Xylene	5.08E-07	1.01	1.74E-03	1.02	98%	0.02	
n-Octane	1.15E-05	19.55	0.04	19.59	98%	0.39	
n-Nonane	8.78E-08	1.76	1.14E-03	1.77	98%	0.04	
n-Decane	5.11E-10	0.07	1.81E-05	0.07	98%	1.37E-03	
Water	1.66E-03	104.09	0.94	105.04	0%	105.04	
TEG	1.23E-05	--	--	1.23E-05	98%	2.46E-07	
Total	3.48	65,836.30	194.81	66,034.59	--	5,287.05	
Total VOC	1.29	25,586.91	94.92	25,683.12	--	372.58	
Total HAP	0.01	533.33	3.90	537.24	--	10.74	
Heat Value of Stream (Btu/scf)	1,458.11	1,483.90	1,640.98	1,484.37			
Molecular Weight	26.40	26.90	29.75	--			
SO ₂ emissions (lb/hr)	--	--	--	--			
Volumetric Flow (scf/hr)	50.00	928,918.16	2,800.00	931,768.16			
Heat Release (MMBtu/hr)	0.07	1,378.42	4.59	1,383.09			

^a Uncontrolled stream properties determined via ProMax.

^b Gas Sales Line Downtime emissions based on "gas from slug catcher stream".

^c Flare Exhaust (lb/hr) = Total Uncontrolled Emissions (lb/hr) x (100-Flare DRE (%)).

^d Flare CO and NOx emission factors from AP-42 Table 13.5-1 (Emissions Factors for Flare Operations). PM and PM_{2.5} emission factors from AP-42, Table 1.4-1 and 1.4-2, July 1998. SO₂ emissions assume 100% conversion of H₂S to SO₂.

^e 40 CFR 98 Subpart C, Table C-1 and C-2. Emission Factor (lb/MMBtu) = Emission factor (kg/MMBtu) * (2.20462 lb/kg)

^f Global Warming Potentials from Table A-1 of Subpart A of Part 98 for Mandatory Greenhouse Gas Reporting.

^g 40 CFR 98.233 (Subpart W), equation W-40. Mass N₂O = (10E-3) x scf x HHV x EF

^h Pre-Control Emissions

ⁱ DRE from TCEQ Air Permit Technical Guidance for Chemical Sources: Flares and Vapor Oxidizers, October 2000 RG-109

Van Hook Gathering Services, LLC
FBIR Compressor Station
Flare - Hourly

Sample Calculations

Flare PM emissions were calculated using the following formula:

$$\text{Emissions} = \text{EF} / \text{CF} * \text{THR}$$

where,

Emissions = Flare emissions (lb/hr)

EF = Emission factor (lb/ 10^6 scf)

CF = 1020 (Btu/scf) Conversion factor from scf to Btu

THR = Total Heat Release (MMBtu/hr)

NO_x and CO emissions were calculated using the equation below:

$$\text{Emissions} = \text{EF} * \text{THR}$$

where,

EF = Emission factor (lb/MMBtu)

THR = Total Heat Release (MMBtu/hr)

VOC and speciated (HAP) emissions were calculated using the equation below:

$$\text{Emissions} = \text{MR}_i * (100\% - \text{DE}_{\text{VOC}})$$

where,

MR = Mass Rate (lb/hr)

DE_{VOC} = VOC destruction efficiency (%)

H₂S emissions were calculated using the equation below:

$$\text{Emissions} = \text{MR}_{\text{H}_2\text{S}} * (100\% - \text{DE}_{\text{H}_2\text{S}})$$

where,

MR_{H₂S} = Mass Rate of H₂S (lb/hr)

DE_{H₂S} = H₂S destruction efficiency (%)

SO₂ emissions were calculated assuming 100% of the H₂S was converted to SO₂, as shown in the equation below:

$$\text{Emissions} = \text{MR}_{\text{H}_2\text{S}} * \text{MW}_{\text{SO}_2} / \text{MW}_{\text{H}_2\text{S}}$$

where,

MR_{H₂S} = Mass Rate of H₂S (lb/hr)

MW_{SO₂} = Molecular weight of SO₂ (lb/lbmole)

MW_{H₂S} = Molecular weight of H₂S (lb/lbmole)

Emissions were calculated separately for each fuel stream, then summed for the flare as a whole. Hourly emissions were calculated using the hourly volume of the fuel combusted. Annual emissions were calculated using the annual volume of the fuel combusted, and dividing by 2,000 lb/ton.

Van Hook Gathering Services, LLC
 FBIR Compressor Station
 Flare - Annual

Component	Flare Feed Rates and Composition ^{a,b}					Flare DRE% ^c (%)	Flare Exhaust Components ^d TPY	Criteria Pollutant Emissions ^e
	Pilot TPY	Gas Sales Line Downtime TPY	MSS-Compressor Blowdowns TPY	Total ^b TPY	Flare DRE% ^c (%)			
CO2	0.16	106.69	0.13	106.98	0%	106.98		
H2S	--	--	--	--	98%	--		
N2	0.90	606.57	0.70	608.17	0%	608.17		
Methane	4.98	3,352.28	3.93	3,361.19	99%	33.61		
Ethane	3.53	2,382.67	2.96	2,389.17	99%	23.89		
Propane	3.33	2,259.42	3.18	2,265.93	99%	22.66		
Isobutane	0.41	283.10	0.48	283.99	98%	5.68		
n-Butane	1.25	877.14	1.68	880.07	98%	17.60		
Isopentane	0.22	168.33	0.45	169.00	98%	3.38		
n-Pentane	0.30	237.65	0.70	238.65	98%	4.77		
Cyclopentane	3.54E-04	0.32	1.04E-03	0.32	98%	0.01		
n-Hexane	0.04	71.27	0.27	71.58	98%	1.43		
Cyclohexane	4.15E-03	8.82	0.03	8.85	98%	0.18		
i-C6	0.09	106.69	0.40	107.18	98%	2.14		
n-Heptane	0.01	72.13	0.15	72.29	98%	1.45		
Methylcyclohexane	8.35E-04	7.12	0.01	7.14	98%	0.14		
2,2,4-Trimethylpentane	1.20E-03	9.05	0.02	9.07	98%	0.18		
Benzene	2.61E-03	3.86	0.01	3.87	98%	0.08		
Toluene	1.66E-04	1.31	2.83E-03	1.31	98%	0.03		
Ethylbenzene	1.92E-07	0.01	1.07E-05	0.01	98%	2.37E-04		
m-Xylene	2.22E-06	0.16	1.36E-04	0.16	98%	3.26E-03		
n-Octane	5.06E-05	3.14	2.74E-03	3.14	98%	0.06		
n-Nonane	3.85E-07	0.28	8.89E-05	0.28	98%	0.01		
n-Decane	2.24E-09	0.01	1.41E-06	0.01	98%	2.20E-04		
Water	0.01	16.72	0.07	16.80	0%	16.80		
TEG	5.39E-05	--	--	5.39E-05	98%	1.08E-06		
Total	15.24	10,574.75	15.20	10,605.19	--	849.25		
Total VOC	5.66	4,109.82	7.40	4,122.88	--	59.80		
Total HAP	0.05	85.66	0.30	86.02	--	1.72		
Heat Value of Stream (Btu/scf)	1,458.11	1,483.90	1,640.98	1,484.09				
Molecular Weight	26.40	26.90	29.75	--				
SO ₂ emissions (tpy)	--	--	--	--				
Volumetric Flow (scf/yr)	438,000.00	298,409,069.77	436,800.00	299,283,869.77				
Total heat release (MMBtu/yr)	638.65	442,808.76	716.78	444,164.19				

^a Uncontrolled stream properties determined via ProMax.

^b Gas Sales Line Downtime emissions based on "gas from slug catcher stream".

^c Flare Exhaust (tpy) = Total Uncontrolled Emissions (tpy) x (100-Flare DRE (%)).

^d Flare CO and NOx emission factors from AP-42 Table 13.5-1 (Emissions Factors for Flare Operations). PM and PM_{2.5} emission factors from AP-42, Table 1.4-1 and 1.4-2, July 1998. SO₂ emissions assume 100% conversion of H₂S to SO₂.

^e 40 CFR 98 Subpart C, Table C-1 and C-2. Emission Factor (lb/MMBtu) = Emission factor (kg/MMBtu) * (2.20462 lb/kg)

^f Global Warming Potentials from Table A-1 of Subpart A of Part 98 for Mandatory Greenhouse Gas Reporting.

^g 40CFR 98.233 (Subpart W), equation W-40. Mass N₂O = (10E-3) x scf x HHV x EF

^h Pre-Control Emissions

ⁱ DRE from TCEQ Air Permit Technical Guidance for Chemical Sources: Flares and Vapor Oxidizers, October 2000 RG-109

Van Hook Gathering Services, LLC
 FBIR Compressor Station
 Flare - Annual PTE

Flare Feed Rates and Composition ^{a,b}				Flare DRE% ^c	Flare Exhaust Components ^d	Criteria Pollutant Emissions ^e
Component	Pilot	Gas Sales Line Downtime 8760 hr/yr	Total ^b			
	TPY	TPY	TPY	(%)	TPY	
CO2	0.16	2,909.40	2,909.56	0%	2,909.56	NO _x factor: 0.0680 lb/MMBtu
H2S	--	--	--	98%	--	CO factor: 0.3700 lb/MMBtu
N2	0.90	16,540.44	16,541.34	0%	16,541.34	PM ₁₀ factor: 7.60 lb/MMscf
Methane	4.98	91,413.43	91,418.42	99%	914.18	PM _{2.5} factor: 7.60 lb/MMscf
Ethane	3.53	64,973.15	64,976.69	99%	649.77	NO _x emissions from flare: 410.57 ton/yr
Propane	3.33	61,612.27	61,615.60	99%	616.16	CO emissions from flare: 2,233.99 ton/yr
Isobutane	0.41	7,719.92	7,720.33	98%	154.41	SO ₂ emissions from flare: -- ton/yr
n-Butane	1.25	23,918.66	23,919.91	98%	478.40	PM ₁₀ emissions from flare: 44.99 ton/yr
Isopentane	0.22	4,590.19	4,590.41	98%	91.81	PM _{2.5} emissions from flare: 44.99 ton/yr
n-Pentane	0.30	6,480.53	6,480.83	98%	129.62	H ₂ S emissions from flare: -- ton/yr
Cyclopentane	3.54E-04	8.62	8.62	98%	0.17	GHG Pollutant Emissions ^{f,g,h}
n-Hexane	0.04	1,943.44	1,943.48	98%	38.87	GHG CO ₂ Factor ^e : 116.98 lb/MMBTU
Cyclohexane	4.15E-03	240.48	240.48	98%	4.81	GHG N ₂ O Factor ^e : 2.20E-04 lb/MMBTU
i-C6	0.09	2,909.36	2,909.44	98%	58.19	GWP CO ₂ Equivalent ^f : 1
n-Heptane	0.01	1,966.79	1,966.80	98%	39.34	GWP CH ₄ Equivalent ^f : 25
Methylcyclohexane	8.35E-04	194.20	194.20	98%	3.88	GWP N ₂ O Equivalent ^f : 298.00
2,2,4-Trimethylpentane	1.20E-03	246.79	246.80	98%	4.94	CO ₂ emissions: 709,194.10 tpy
Benzene	2.61E-03	105.21	105.21	98%	2.10	CH ₄ emissions: 914.18 tpy
Toluene	1.66E-04	35.78	35.78	98%	0.72	N ₂ O emissions: 1.33 tpy
Ethylbenzene	1.92E-07	0.32	0.32	98%	0.01	CO _{2e} emissions: 732,444.54 tpy
m-Xylene	2.22E-06	4.44	4.44	98%	0.09	
n-Octane	5.06E-05	85.64	85.64	98%	1.71	
n-Nonane	3.85E-07	7.73	7.73	98%	0.15	
n-Decane	2.24E-09	0.30	0.30	98%	0.01	
Water	0.01	455.93	455.94	0%	455.94	
TEG	5.39E-05	--	5.39E-05	98%	1.08E-06	
Total	15.24	288,363.00	288,378.25	--	23,096.15	
Total VOC	5.66	112,070.65	112,076.31	--	1,625.37	
Total HAP	0.05	2,335.98	2,336.03	--	46.72	
Heat Value of Stream (Btu/scf)	1,458.11	1,483.90	1,483.90			
Molecular Weight	26.40	26.90	--			
SO ₂ emissions (tpy)	--	--	--			
Volumetric Flow (scf/yr)	438,000.00	8,137,323,042.67	8,137,761,042.67			
Total heat release (MMBtu/yr)	638.65	12,074,961.03	12,075,599.68			

^a Uncontrolled stream properties determined via ProMax.

^b Gas Sales Line Downtime emissions based on "gas from slug catcher stream".

^c Flare Exhaust (tpy) = Total Uncontrolled Emissions (tpy) x (100-Flare DRE (%)).

^d Flare CO and NOx emission factors from AP-42 Table 13.5-1 (Emissions Factors for Flare Operations). PM and PM_{2.5} emission factors from AP-42, Table 1.4-1 and 1.4-2, July 1998. SO₂ emissions assume 100% conversion of H₂S to SO₂.

^e 40 CFR 98 Subpart C, Table C-1 and C-2. Emission Factor (lb/MMBtu) = Emission factor (kg/MMBtu) * (2.20462 lb/kg)

^f Global Warming Potentials from Table A-1 of Subpart A of Part 98 for Mandatory Greenhouse Gas Reporting.

^g 40CFR 98.233 (Subpart W), equation W-40. Mass N₂O = (10E-3) x scf x HHV x EF

^h Pre-Control Emissions

ⁱ DRE from TCEQ Air Permit Technical Guidance for Chemical Sources: Flares and Vapor Oxidizers, October 2000 RG-109

Van Hook Gathering Services, LLC
 FBIR Compressor Station
 Enclosed Combustor - Hourly

Component	Pilot	Enclosed Combustor Feed Rates and Composition ^a							Enclosed Combustor DRE% ^b	Enclosed Combustor Exhaust Components ^c	Criteria Pollutant Emissions ^d
		AOS Flash Tank Vapors ^e	Oil Loading Emissions	AOS Regenerator Overheads	Crude Oil Tanks Flashing	Crude Oil Tanks Working and Breathing	Total ^f	(lb/hr)			
CO2	0.04	0.63	0.16	0.24	0.32	0.01	1.40	0%	1.40	NO _x factor:	0.0680 lb/MMBtu
H2S	--	--	--	--	--	--	--	98%	--	CO factor:	0.3700 lb/MMBtu
N2	0.21	0.21	9.05E-04	1.95E-03	0.18	2.92E-05	0.59	0%	0.59	PM ₁₀ factor:	7.60 lb/MMscf
Methane	1.14	3.14	0.25	0.12	3.38	0.01	8.02	99%	0.08	PM _{2.5} factor:	7.60 lb/MMscf
Ethane	0.81	3.97	19.21	0.50	15.75	0.62	40.87	99%	0.41		
Propane	0.76	4.10	49.34	0.92	41.66	1.59	98.38	99%	0.98		
Isobutane	0.09	0.40	9.92	0.10	9.12	0.32	19.96	98%	0.40	NO _x emissions from Enclosed Combustor:	0.59 lb/hr
n-Butane	0.29	1.55	35.28	0.54	33.06	1.14	71.86	98%	1.44	CO emissions from Enclosed Combustor:	3.20 lb/hr
Isopentane	0.05	0.25	7.15	0.11	8.07	0.23	15.86	98%	0.32	SO ₂ emissions from Enclosed Combustor:	-- lb/hr
n-Pentane	0.07	0.34	10.60	0.15	12.09	0.34	23.60	98%	0.47	PM ₁₀ emissions from Enclosed Combustor:	0.06 lb/hr
Cyclopentane	8.07E-05	7.74E-04	0.01	3.87E-04	0.02	4.16E-04	0.03	98%	6.27E-04	PM _{2.5} emissions from Enclosed Combustor:	0.06 lb/hr
n-Hexane	0.01	0.04	3.63	0.02	4.31	0.12	8.12	98%	0.16	H ₂ S emissions from Enclosed Combustor:	-- lb/hr
Cyclohexane	9.48E-04	0.01	0.34	3.07E-03	0.53	0.01	0.89	98%	0.02		
i-C6	0.02	0.09	5.27	0.04	6.12	0.17	11.72	98%	0.23		
n-Heptane	2.06E-03	0.01	3.58	3.53E-03	4.68	0.12	8.40	98%	0.17		
Methylcyclohexane	1.91E-04	9.37E-04	0.36	4.59E-04	0.46	0.01	0.83	98%	0.02		
2,2,4-Trimethylpentane	2.73E-04	9.13E-04	0.45	4.45E-04	0.58	0.01	1.04	98%	0.02		
Benzene	5.95E-04	0.01	0.11	2.66E-03	0.22	3.55E-03	0.35	98%	0.01		
Toluene	3.80E-05	2.21E-04	0.04	1.11E-04	0.08	1.26E-03	0.12	98%	2.50E-03		
Ethylbenzene	4.39E-08	1.64E-07	3.71E-04	8.12E-08	8.22E-04	1.20E-05	1.21E-03	98%	2.41E-05		
m-Xylene	5.08E-07	1.80E-06	0.01	8.91E-07	0.01	2.15E-04	0.02	98%	3.65E-04		
n-Octane	1.15E-05	2.98E-05	0.16	1.43E-05	0.22	0.01	0.38	98%	0.01	GWP CO ₂ Equivalent ^g :	1
n-Nonane	8.78E-08	1.50E-07	0.01	7.16E-08	0.02	4.80E-04	0.04	98%	7.47E-04	GWP CH ₄ Equivalent ^g :	25
n-Decane	5.11E-10	5.75E-10	5.22E-04	2.72E-10	8.78E-04	1.69E-05	1.42E-03	98%	2.83E-05	GWP N ₂ O Equivalent ^g :	298
Water	1.66E-03	0.09	0.17	0.05	1.18	0.01	1.49	0%	1.49	CO ₂ emissions:	1,014.35 lb/hr
TEG	1.23E-05	2.95E-05	--	1.44E-05	--	--	5.62E-05	98%	1.12E-06	CH ₄ emissions:	0.08 lb/hr
Total	3.48	14.83	160.89	163.70	142.06	4.72	313.96	--	8.22	N ₂ O emissions:	1.91E-03 lb/hr
Total VOC	1.29	6.79	126.27	1.91	121.26	4.08	261.59	--	4.25	CO ₂ e emissions:	1,016.93 lb/hr
Total HAP	0.01	0.05	4.23	0.63	5.21	0.14	9.65	--	0.19		
Heat Value of Stream (Btu/scf)	1,458.11	1,662.46	2,782.99	2,110.96	2,691.99	2,782.99	2,661.75				
Molecular Weight	26.40	30.22	49.27	41.07	48.10	49.27	--				
SO ₂ emissions (lb/hr)	--	--	--	--	--	--	--				
Volumetric Flow (scf/hr)	50.00	186.26	1,833.91	25.99	1,120.79	36.33	3,253.28				
Heat Release (MMBtu/hr)	0.07	0.31	5.10	0.05	3.02	0.10	8.66				

^a Uncontrolled stream properties determined via ProMax.

^b Tank emissions determined in ProMax at the maximum daily liquid surface temperature.

^c Enclosed Combustor Exhaust (lb/hr) = Total Uncontrolled Emissions (lb/hr) x (100-Enclosed Combustor DRE (%)).

^d Enclosed Combustor CO and NOx emission factors from AP-42 Table 13.5-1 (Emissions Factors for Flare Operations). PM and PM_{2.5} emission factors from AP-42, Table 1.4-1 and 1.4-2, July 1998. SO₂ emissions assume 100% conversion of H₂S to SO₂.

^e 40 CFR 98 Subpart C, Table C-1 and C-2. Emission Factor (lb/MMBtu) = Emission factor (kg/MMBtu) * (2.20462 lb/kg)

^f Global Warming Potentials from Table A-1 of Subpart A of Part 98 for Mandatory Greenhouse Gas Reporting.

^g 40CFR 98.233 (Subpart W), equation W-40. Mass N₂O = (10E-3) x scf x HHV x EF

^h Pre-Control Emissions

ⁱ DRE from TCEQ Air Permit Technical Guidance for Chemical Sources: Flares and Vapor Oxidizers, October 2000 RG-109

Sample Calculations

Enclosed Combustor PM emissions were calculated using the following formula:

$$\text{Emissions} = \text{EF} / \text{CF} * \text{THR}$$

where,

Emissions = Enclosed Combustor emissions (lb/hr)
EF = Emission factor (lb/ 10^6 scf)
CF = 1020 (Btu/scf) Conversion factor from scf to Btu
THR = Total Heat Release (MMBtu/hr)

NO_x and CO emissions were calculated using the equation below:

$$\text{Emissions} = \text{EF} * \text{THR}$$

where,

EF = Emission factor (lb/MMBtu)
THR = Total Heat Release (MMBtu/hr)

VOC and speciated (HAP) emissions were calculated using the equation below:

$$\text{Emissions} = \text{MR}_i * (100\% - \text{DE}_{\text{VOC}})$$

where,

MR = Mass Rate (lb/hr)
 DE_{VOC} = VOC destruction efficiency (%)

H₂S emissions were calculated using the equation below:

$$\text{Emissions} = \text{MR}_{\text{H}_2\text{S}} * (100\% - \text{DE}_{\text{H}_2\text{S}})$$

where,

$\text{MR}_{\text{H}_2\text{S}}$ = Mass Rate of H₂S (lb/hr)
 $\text{DE}_{\text{H}_2\text{S}}$ = H₂S destruction efficiency (%)

SO₂ emissions were calculated assuming 100% of the H₂S was converted to SO₂, as shown in the equation below:

$$\text{Emissions} = \text{MR}_{\text{H}_2\text{S}} * \text{MW}_{\text{SO}_2} / \text{MW}_{\text{H}_2\text{S}}$$

where,

$\text{MR}_{\text{H}_2\text{S}}$ = Mass Rate of H₂S (lb/hr)
 MW_{SO_2} = Molecular weight of SO₂ (lb/lbmole)
 $\text{MW}_{\text{H}_2\text{S}}$ = Molecular weight of H₂S (lb/lbmole)

Emissions were calculated separately for each fuel stream, then summed for the Enclosed Combustor as a whole. Hourly emissions were calculated using the hourly volume of the fuel combusted. Annual emissions were calculated using the annual volume of the fuel combusted, and dividing by 2,000 lb/ton.

Van Hook Gathering Services, LLC
 FBIR Compressor Station
 Enclosed Combustor - Annual

Regenerator Vapors to EC: 100%
 Flash Tank Vapors to EC: 100%

Component	Pilot	Enclosed Combustor Feed Rates and Composition ^{a,b}							Enclosed Combustor DRE% ⁱ	Enclosed Combustor Exhaust Components ^c	Criteria Pollutant Emissions ^d
		AOS - Flash Tank Vapors	AOS - Oil Loading Emissions	AOS - Regenerator Overheads	Crude Oil Tanks Flashing	Crude Oil Tanks Working and Breathing	Total ^b	TPY			
CO2	0.16	2.77	0.01	1.05	1.32	0.02	5.34	0%	5.34	NO _x factor:	0.0680 lb/MMBtu
H2S	--	--	--	--	--	--	--	98%	--	CO factor:	0.3700 lb/MMBtu
N2	0.90	0.92	6.98E-05	0.01	0.77	1.28E-04	2.60	0%	2.60	PM ₁₀ factor:	7.60 lb/MMscf
Methane	4.98	13.74	0.02	0.51	14.52	0.03	33.81	99%	0.34	PM _{2.5} factor:	7.60 lb/MMscf
Ethane	3.53	17.41	1.48	2.19	60.58	2.72	87.91	99%	0.88		
Propane	3.33	17.96	3.81	4.04	128.58	6.98	164.70	99%	1.65		
Isobutane	0.41	1.76	0.77	0.46	22.48	1.40	27.28	98%	0.55	NO _x emissions from Enclosed Combustor:	0.72 ton/yr
n-Butane	1.25	6.77	2.72	2.38	75.09	4.99	93.20	98%	1.86	CO emissions from Enclosed Combustor:	3.91 ton/yr
Isopentane	0.22	1.09	0.55	0.49	15.81	1.01	19.18	98%	0.38	SO ₂ emissions from Enclosed Combustor:	-- ton/yr
n-Pentane	0.30	1.49	0.82	0.67	22.67	1.50	27.44	98%	0.55	PM ₁₀ emissions from Enclosed Combustor:	0.08 ton/yr
Cyclopentane	3.54E-04	3.39E-03	9.95E-04	1.69E-03	0.03	1.82E-03	0.04	98%	7.75E-04	PM _{2.5} emissions from Enclosed Combustor:	0.08 ton/yr
n-Hexane	0.04	0.18	0.28	0.09	7.06	0.51	8.17	98%	0.16	H ₂ S emissions from Enclosed Combustor:	-- ton/yr
Cyclohexane	4.15E-03	0.03	0.03	0.01	0.87	0.05	0.99	98%	0.02		
i-C6	0.09	0.40	0.41	0.19	10.48	0.75	12.31	98%	0.25		
n-Heptane	0.01	0.03	0.28	0.02	7.08	0.51	7.92	98%	0.16		
Methylcyclohexane	8.35E-04	4.10E-03	0.03	2.01E-03	0.70	0.05	0.79	98%	0.02		
2,2,4-Trimethylpentane	1.20E-03	4.00E-03	0.03	1.95E-03	0.89	0.06	0.99	98%	0.02		
Benzene	2.61E-03	0.02	0.01	0.01	0.38	0.02	0.44	98%	0.01		
Toluene	1.66E-04	9.68E-04	3.01E-03	4.86E-04	0.13	0.01	0.14	98%	2.78E-03		
Ethylbenzene	1.92E-07	7.18E-07	2.86E-05	3.56E-07	1.16E-03	5.25E-05	1.25E-03	98%	2.49E-05		
m-Xylene	2.22E-06	7.88E-06	5.15E-04	3.90E-06	0.02	9.43E-04	0.02	98%	3.50E-04		
n-Octane	5.06E-05	1.30E-04	0.01	6.25E-05	0.31	0.02	0.34	98%	0.01		
n-Nonane	3.85E-07	6.56E-07	1.15E-03	3.14E-07	0.03	2.10E-03	0.03	98%	6.26E-04		
n-Decane	2.24E-09	2.52E-09	4.03E-05	1.19E-09	1.06E-03	7.38E-05	1.17E-03	98%	2.34E-05		
Water	0.01	0.38	0.01	0.20	1.69	0.02	2.31	0%	2.31		
TEG	5.39E-05	1.29E-04	--	6.33E-05	--	--	2.46E-04	98%	4.93E-06		
Total	15.24	64.96	11.27	12.32	371.48	20.66	495.93	--	17.10		
Total VOC	5.66	29.74	9.74	8.37	292.60	17.86	363.97	--	5.63		
Total HAP	0.05	0.21	0.33	0.10	8.48	0.60	9.76	--	0.20		
Heat Value of Stream (Btu/scf)	1,458.11	1,662.46	2,782.99	2,110.96	2,463.82	2,782.99	2,283.06				
Molecular Weight	26.40	30.22	49.27	41.07	43.66	49.27	--				
SO ₂ emissions (TPY)	--	--	--	--	--	--	--				
Volumetric Flow (scf/yr)	438,000.00	1,631,640.25	173,594.76	227,695.22	6,457,377.19	318,233.99	9,246,541.39				
Heat Release (MMBtu/yr)	638.65	2,712.54	483.11	480.66	15,909.79	885.64	21,110.39				

^a Uncontrolled stream properties determined via ProMax.

^b Tank emissions determined in ProMax at the maximum daily liquid surface temperature.

^c Enclosed Combustor Exhaust (lb/hr) = Total Uncontrolled Emissions (lb/hr) x (100-Enclosed Combustor DRE (%)).

^d Enclosed Combustor CO and NOx emission factors from AP-42 Table 13.5-1 (Emissions Factors for Flare Operations). PM and PM_{2.5} emission factors from AP-42, Table 1.4-1 and 1.4-2, July 1998. SO₂ emissions assume 100% conversion of H₂S to SO₂.

^e 40 CFR 98 Subpart C, Table C-1 and C-2. Emission Factor (lb/MMBtu) = Emission factor (kg/MMBtu) * (2.20462 lb/kg)

^f Global Warming Potentials from Table A-1 of Subpart A of Part 98 for Mandatory Greenhouse Gas Reporting.

^g 40CFR 98.233 (Subpart W), equation W-40. Mass N₂O = (10E-3) x scf x HHV x EF

^h Pre-Control Emissions

ⁱ DRE from TCEQ Air Permit Technical Guidance for Chemical Sources: Flares and Vapor Oxidizers, October 2000 RG-109

Van Hook Gathering Services, LLC
FBIR Compressor Station
MSS-Blowdown

Equipment ID	BD-1
Identifier	Compressor Blowdowns

Describe this MSS event in detail, include specifically what is being done and how it is being done.	Compressors are blown down for maintenance and other purposes. A total of 156 compressor blowdowns is estimated per year. It is assumed a total of 2,800 scf of equipment is blown down per event.
--	--

Venting Emission Calculation

Volume of the Vented Unit (scf - standard cubic feet)	2800	Ideal Gas Constant, [(ft ³ *psia)/(R*lb-mol)]
Duration of Each Event (hours/event)	1	10.73159
Venting Gas Molecular Weight (lb/lb-mol)	26.40	
Total Gas to Flare (scf/yr)	436,800.00	
Total Gas to Flare (lb/hr)	194.81	
Total Gas to Flare (TPY)	15.20	
Are planned MSS vapors (A) uncontrolled; (B) controlled by a flare, vapor combustor, thermal oxidizer, or vapor recovery unit (VRU); or (C) controlled by another type of control device?	(B) cont. by flare/VC/TO/VRU	

Speciated Emissions to Flare

Component	lb/hr	TPY
CO ₂	1.63	0.13
H ₂ S	--	--
N ₂	9.01	0.70
Methane	50.35	3.93
Ethane	37.95	2.96
Propane	40.75	3.18
Isobutane	6.17	0.48
n-Butane	21.55	1.68
Isopentane	5.77	0.45
n-Pentane	9.00	0.70
Cyclopentane	0.01	1.04E-03
n-Hexane	3.43	0.27
Cyclohexane	0.39	0.03
i-C ₆	5.18	0.40
n-Heptane	1.97	0.15
Methylcyclohexane	0.19	0.01
2,2,4-Trimethylpentane	0.26	0.02
Benzene	0.18	0.01
Toluene	0.04	2.83E-03
Ethylbenzene	1.37E-04	1.07E-05
m-Xylene	1.74E-03	1.36E-04
n-Octane	0.04	2.74E-03
n-Nonane	1.14E-03	8.89E-05
n-Decane	1.81E-05	1.41E-06
Water	0.94	0.07
TEG	--	--
Total	194.81	15.20
Total CO ₂	1.63	0.13
Total Methane	50.35	3.93
Total CO _{2e}	1,260.48	98.32
Total VOC	94.92	7.40
Total HAP	3.90	0.30

Van Hook Gathering Services, LLC

FBIR Compressor Station

FL-1 Compliance

FL-1 Specifications

Flare Type	Air-assisted
Gas to Flare (MSCFD)	32,124.52
Total Flow (SCFM)	22,308.69
Flare Diameter (ft)	0.67
Tip Velocity (ft/sec)	761.46
Gas Heating Value (Btu/scf)	1,484.37
Gas Volume (mcf/hr)	1,338.52
Heat Release (Btu/hr)	1,383,087,849.67
SO ₂ Emission Rate (lb/hr)	--

40 CFR 60.18 (c)(3)(ii) Compliance Demonstration

Net Heating Value (Btu/scf)	Is the Net Heating Value greater than or equal to 300 Btu/scf?	Is the flare in compliance with (c)(3)(i)?
1,484	YES	YES

40 CFR 60.18 (c)(4) Compliance Demonstration

Vmax (ft/sec)	Is the tip velocity less than Vmax?	Is the flare in compliance with 40 CFR 60.18 (c)(4)?
128,667.11	YES	YES

Van Hook Gathering Services, LLC

FBIR Compressor Station

EC-1 Compliance

EC-1 Specifications

EC Type	Unassisted
Gas to Flare (MSCFD)	1,810.17
Total Flow (SCFM)	1,257.06
EC Diameter (ft)	1.00
Tip Velocity (ft/sec)	25.62
Gas Heating Value (Btu/sec)	2,661.75
Gas Volume (mcf/hr)	75.42
Heat Release (Btu/hr)	8,659,430.17
SO₂ Emission Rate (lb/hr)	--

40 CFR 60.18 (c)(3)(ii) Compliance Demonstration

Net Heating Value (Btu/sec)	Is the Net Heating Value greater than or equal to 200 Btu/sec?	Is the flare in compliance with (c)(3)(ii)?
2,662	YES	YES

40 CFR 60.18 (c)(4) Compliance Demonstration

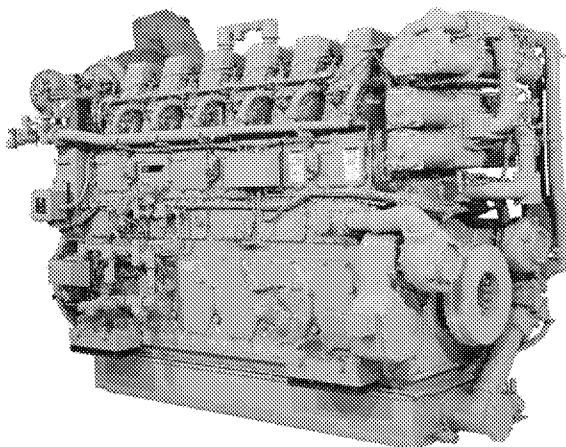
Is the lower heating value less than or greater than 1,000 Btu/sec?	Is the tip velocity less than 400 ft/s?	Is the flare in compliance with 40 CFR 60.18 (c)(4)?
Greater Than	YES	YES



G3606 LE Gas Petroleum Engine

1324-1413 kW
(1775-1895 bhp)
1000 rpm

0.5 g/bhp-hr NOx or 0.7 g/bhp-hr NOx (NTE)



Shown with
Optional Equipment

CAT® ENGINE SPECIFICATIONS

In-Line 6, 4-Stroke-Cycle

Bore	300 mm (11.8 in.)
Stroke	300 mm (11.8 in.)
Displacement.....	127.2 L (7,762 cu. in.)
Aspiration	Turbocharged-Aftercooled
Digital Engine Management	
Governor and Protection....	Electronic (ADEM™ A3)
Combustion	Low Emission (Lean Burn)
Engine Weight	
net dry (approx).....	15,676 kg (34,560 lb)
Power Density	11.1 kg/kW (18.2 lb/hp)
Power per Displacement.....	14.9 bhp/L
Total Cooling System Capacity.....	401.3 L (106 gal)
Jacket Water	340.7 L (90 gal)
Aftercooler Circuit.....	60.6 L (16 gal)
Lube Oil System (refill).....	707.9 L (187 gal)
Oil Change Interval.....	5000 hours
Rotation (from flywheel end).....	Counterclockwise
Flywheel Teeth.....	255

FEATURES

Engine Design

- Proven reliability and durability
- Ability to burn a wide spectrum of gaseous fuels
- Robust diesel strength design prolongs life and lowers owning and operating costs
- Broad operating speed range

Emissions

Meets U.S. EPA Spark Ignited Stationary NSPS Emissions for 2010/11 with the use of an oxidation catalyst

Lean Burn Engine Technology

Lean-burn engines operate with large amounts of excess air. The excess air absorbs heat during combustion reducing the combustion temperature and pressure, greatly reducing levels of NOx. Lean-burn design also provides longer component life and excellent fuel consumption.

Ease of Operation

- High-strength pan and rails for excellent mounting and stability
- Side covers on block allow for inspection of internal components

Advanced Digital Engine Management

ADEM A3 engine management system integrates speed control, air/fuel ratio control, and ignition/detonation controls into a complete engine management system. ADEM A3 has improved: user interface, display system, shutdown controls, and system diagnostics.

Full Range of Attachments

Large variety of factory-installed engine attachments reduces packaging time.

Testing

Every engine is full-load tested to ensure proper engine performance.

Gas Engine Rating Pro

GERP is a PC-based program designed to provide site performance capabilities for Cat® natural gas engines for the gas compression industry. GERP provides engine data for your site's altitude, ambient temperature, fuel, engine coolant heat rejection, performance data, installation drawings, spec sheets, and pump curves.

Product Support Offered Through Global Cat Dealer Network

More than 2,200 dealer outlets

Cat factory-trained dealer technicians service every aspect of your petroleum engine

Cat parts and labor warranty

Preventive maintenance agreements available for repair-before-failure options

S•O•S™ program matches your oil and coolant samples against Caterpillar set standards to determine:

- Internal engine component condition
- Presence of unwanted fluids
- Presence of combustion by-products
- Site-specific oil change interval

Over 80 Years of Engine Manufacturing Experience

Over 60 years of natural gas engine production

Ownership of these manufacturing processes enables Caterpillar to produce high quality, dependable products

- Cast engine blocks, heads, cylinder liners, and flywheel housings

- Machine critical components

- Assemble complete engine

Web Site

For all your petroleum power requirements, visit www.catoilandgas.cat.com.



G3606 LE GAS PETROLEUM ENGINE

1324-1413 kW (1775-1895 bhp)

STANDARD EQUIPMENT

Air Inlet System

Air cleaner — standard-duty inlet air adapter

Control System

ADEM A3 control system provides electronic governing integrated with air/fuel ratio control and individual cylinder ignition timing control

Cooling System

Jacket water pump

Jacket water thermostats and housing

Aftercooler pump

Aftercooler water thermostats and housing

Single-stage aftercooler

Exhaust System

Dry wrapped exhaust manifolds

Vertical outlet adapter

Flywheels and Flywheel Housing

SAE standard rotation

Fuel System

Gas admission valves with electronically controlled fuel supply pressure

Ignition System

A3 control system senses individual cylinder detonation and controls individual cylinder timing

Instrumentation

LCD display panel monitors engine parameters and displays diagnostic codes

Lube System

Crankcase breathers (top mounted)

Oil cooler

Oil filter

Oil pan drain valve

Mounting System

Engine mounting feet (four total)

Protection

Electronic shutoff system with purge cycle

Crankcase explosion relief valves

Gas shutoff valve

Starting System

Air starting system

General

Paint — Cat yellow

Vibration dampers

OPTIONAL EQUIPMENT

Air Inlet System

Heavy-duty air cleaner with precleaners

Heavy-duty air cleaner with rain protection

Charging System

Charging alternators

Control System

Custom control system software is available for non-standard ratings. Software is field programmable using flash memory.

Cooling System

Expansion tank

Flexible connections

Jacket water heater

Exhaust System

Flexible bellows adapters

Exhaust expander

Weld flanges

Fuel System

Fuel filter

Gas pressure regulator

Flexible connection

Low energy fuel system

Corrosive gas fuel system

Ignition System

CSA certification

Instrumentation

Remote data monitoring and speed control

Compatible with Cat® Electronic Technician (ET) and Data View

Communication Device — PL1000T/E

Display panel deletion is optional

Lube System

Air or electric motor-driven prelube

Duplex oil filter

LH or RH service

Lube oil makeup system

Mounting System

Mounting plates (set of six)

Power Take-Offs

Front stub shafts

Starting System

Air pressure reducing valve

Natural gas starting system

General

Engine barring device

Damper guard



G3606 LE GAS PETROLEUM ENGINE

1324-1413 bkW (1775-1895 bhp)

TECHNICAL DATA

G3606 LE Gas Petroleum Engine — 1000 rpm

		DM5137-03	DM5432-05	DM5433-05	DM8605-02
Engine Power					
@ 100% Load	bkW (bhp)	1368 (1835)	1413 (1895)	1324 (1775)	1324 (1775)
@ 75% Load	bkW (bhp)	1026 (1376)	1060 (1421)	993 (1331)	993 (1331)
Engine Speed	rpm	1000	1000	1000	1000
Max Altitude @ Rated Torque and 38°C (100°F)	m (ft)	1219.2 (4000)	1219.2 (4000)	609.6 (2000)	609.6 (2000)
Speed Turndown @ Max Altitude, Rated Torque, and 38°C (100°F)	%	20	20	23	22
SCAC Temperature	°C (°F)	43 (110)	32 (90)	54 (130)	54 (130)
Emissions*					
NOx	g/bkW-hr (g/bhp-hr)	.94 (0.7)	.94 (0.7)	.94 (0.7)	.67 (0.5)
CO	g/bkW-hr (g/bhp-hr)	3.4 (2.5)	3.4 (2.5)	3.4 (2.5)	3.69 (2.75)
CO ₂	g/bkW-hr (g/bhp-hr)	589 (439)	589 (438)	590 (440)	593 (442)
VOC**	g/bkW-hr (g/bhp-hr)	0.8 (0.6)	0.79 (0.59)	0.81 (0.6)	0.85 (0.63)
Fuel Consumption***					
@ 100% Load	MJ/bkW-hr (Btu/bhp-hr)	9.34 (6600)	9.31 (6580)	9.37 (6620)	9.41 (6649)
@ 75% Load	MJ/bkW-hr (Btu/bhp-hr)	9.73 (6876)	9.69 (6849)	9.77 (6903)	9.81 (6933)
Heat Balance					
Heat Rejection to Jacket Water					
@ 100% Load	bkW (Btu/mn)	321 (18,281)	327 (18,645)	314 (17,894)	314 (17,875)
@ 75% Load	bkW (Btu/mn)	278 (15,801)	283 (16,145)	270 (15,400)	272 (15,473)
Heat Rejection to Aftercooler					
@ 100% Load	bkW (Btu/mn)	269 (15,297)	305 (17,339)	235 (13,350)	244 (13,912)
@ 75% Load	bkW (Btu/mn)	149 (8466)	170 (9679)	128 (7300)	134 (7633)
Heat Rejection to Exhaust LHV to 25°C (77° F)					
@ 100% Load		1334 (75,883)	1346 (76,571)	1320 (75,085)	1325 (75,359)
@ 75% Load	bkW (Btu/mn)	1061 (60,310)	1073 (61,021)	1047 (59,560)	1051 (59,787)
Exhaust System					
Exhaust Gas Flow Rate					
@ 100% Load	m ³ /min (cfm)	346.48 (12,236)	352.77 (12,458)	339.92 (12,004)	343.94 (12,146)
@ 75% Load	m ³ /min (cfm)	273.97 (9675)	278.35 (9830)	269.49 (9517)	272.69 (9630)
Exhaust Stack Temperature					
@ 100% Load	°C (°F)	454 (850)	445 (832)	464 (867)	453 (847)
@ 75% Load	°C (°F)	471 (880)	465 (869)	477 (891)	466 (870)
Intake System					
Air Inlet Flow Rate					
@ 100% Load	m ³ /min (scfm)	133.29 (4707)	137.53 (4857)	129.01 (4556)	132.69 (4686)
@ 75% Load	m ³ /min (scfm)	102.96 (3636)	105.42 (3723)	100.50 (3549)	103.36 (3650)
Gas Pressure	kPag (psig)	295-324 (42.8-47)	295-324 (42.8-47)	295-324 (42.8-47)	295-324 (42.8-47)

*at 100% load and speed, all values are listed as not to exceed

**Volatile organic compounds as defined in U.S. EPA 40 CFR 60, subpart JJJJ

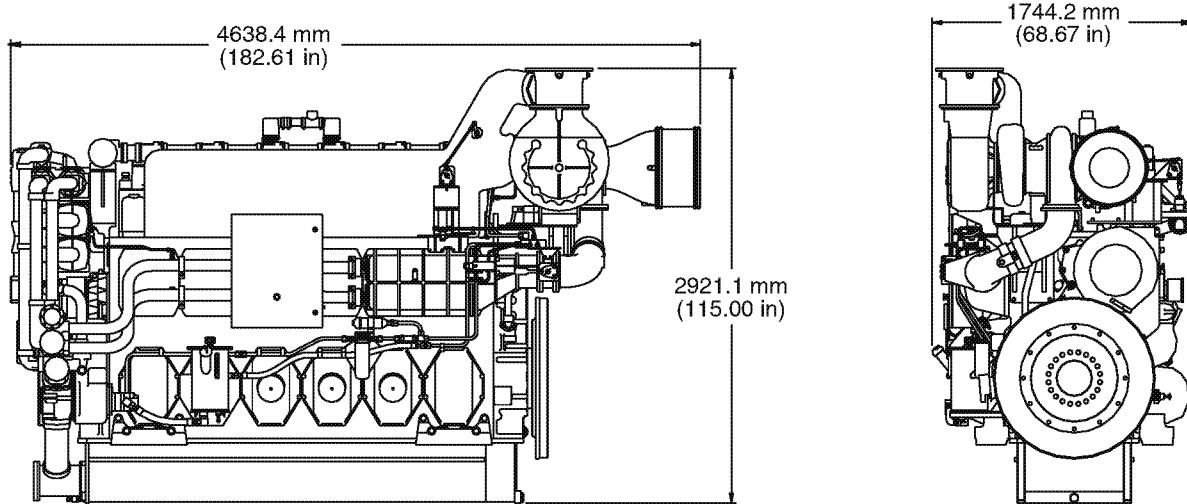
***ISO 3046/1



G3606 LE GAS PETROLEUM ENGINE

1324-1413 kW (1775-1895 bhp)

GAS PETROLEUM ENGINE



DIMENSIONS		
Length	mm (in.)	4638.4 (182.61)
Width	mm (in.)	1744.2 (68.67)
Height	mm (in.)	2921.1 (115.00)
Shipping Weight	kg (lb)	15,676 (34,560)

Note: General configuration not to be used for installation. See general dimension drawings for detail.

RATING DEFINITIONS AND CONDITIONS

Engine performance is obtained in accordance with SAE J1995, ISO3046/1, BS5514/1, and DIN6271/1 standards.

Transient response data is acquired from an engine/generator combination at normal operating temperature and in accordance with ISO3046/1 standard ambient conditions. Also in accordance with SAE J1995, BS5514/1, and DIN6271/1 standard reference conditions.

Conditions: Power for gas engines is based on fuel having an LHV of 33.74 kJ/L (905 Btu/cu ft) at 101 kPa (29.91 in. Hg) and 15° C (59° F). Fuel rate is based on a cubic meter at 100 kPa (29.61 in. Hg) and 15.6° C (60.1° F). Air flow is based on a cubic foot at 100 kPa (29.61 in. Hg) and 25° C (77° F). Exhaust flow is based on a cubic foot at 100 kPa (29.61 in. Hg) and stack temperature.

Materials and specifications are subject to change without notice. The International System of Units (SI) is used in this publication. CAT, CATERPILLAR, their respective logos, S•O•S, ADEM, "Caterpillar Yellow" and the "Power Edge" trade dress, as well as corporate and product identity used herein, are trademarks of Caterpillar and may not be used without permission.



ICE Catalyst Sizing Program

ENGINE INPUT (Manufacturer, Model, Type) - Caterpillar G3606 G3606 - 1775bhp - 1000 RPM - 1 - EXPERT MODE

Input Mass Flow Rate						
lb/hr(Estimated):	20,855	"scfm"	4,712	"scfh"	282,729	"acf"
Brake Horse Power:	1719	"acf"	11871	"acf"	712,260	N2
		Maximum Pressure Drop (in)		12	O2	74.5
Molecular weight:	28.50	0.029		Exhaust Density (lbs/ft3)	H2O	10
					CO2	6
						vol%

Inlet Temperature		Enter permitted grams per brake horse power hour (g/bhp-hr)				
Process Temperature (F):	850	NOx**		CO**	VOC(NMNE)**	H2CO**
		0.5		0.193	0.5	0.0052

Catalyst Type	Catalyst Module Details						
NG/Diesel (Lean)	Module Shape	Square	Module/Layer	4	Layers	1	
	X&Y (inch)	14.875	35.875	cpsi	300	Depth	3.5

Open area for gas flow (ft2):	13.44	Calculated Space Velocity:	72,117	Safety Value	2
Linear Velocity(ft/min):	863				
Foil thickness (inches):	0.002				

Pressure Drop	Inlet Pollutants	g/bhp-hr	lb/hr	tons/year	ppmv	ppmv%O2*
	NOx	0.50	1.89	8.30	55.31	33.26
	CO	2.76	10.46	45.81	305.31	183.82
	VOC	1.11	4.21	18.43	122.79	73.85
300	1.47	H2CO	0.26	0.99	28.76	17.30

Target Conversions	Required Output Pollutants	g/bhp-hr	lb/hr	tons/year	ppmv	ppmv%O2*
NOx	0.0%	NOx	0.5	1.89	8.30	55.31
CO	93.0%	CO	0.193	0.73	3.20	21.35
VOC(NMNE)	55.0%	VOC	0.5	1.90	8.30	55.31
H2CO	98.0%	H2CO	0.0052	0.02	0.09	0.58

Conversions Catalyst Design	Output Pollutants with Catalyst Sizing					
NOx	0.0%	NOx	0.5	1.89	8.30	55.31
CO	93.0%	CO	0.193	0.73	3.20	21.35
VOC(NMNE)	55.0%	VOC	0.5	1.90	8.30	55.31
H2CO	98.0%	H2CO	0.0052	0.02	0.09	0.58

Customer: Pegasus Optimization Managers

Sales Person: KW

Date:

7/20/2018

Project: G3606A3 - North Dakota

Contact: Justin Head

Notes: 4 Elements will be required to meet the 0.5 gr/bhp-hr limit. Insulation of the exhaust piping run will also be required to retain all heat possible.

APPENDIX B
TRIBAL NSR SYNTHETIC MINOR FORMS



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
FEDERAL MINOR NEW SOURCE REVIEW PROGRAM IN INDIAN
COUNTRY
40 CFR 49.151**

Application for New Construction
(Form NEW)

Please check all that apply to show how you are using this form:

- Proposed Construction of a New Source
- Proposed Construction of New Equipment at an Existing Source
- Proposed Modification of an Existing Source
- Other – Please Explain

Use of this information request form is voluntary and not approved by the Office of Management and Budget. The following is a check list of the type of information that Region 8 will use to process information on your proposed project. While submittal of this form is not required, it does offer details on the information we will use to complete your requested approval and providing the information requested may help expedite the process. An application form approved by the Office of Management and Budget can be found online at https://www.epa.gov/sites/production/files/2015-12/documents/new_source_general_application_rev2017.pdf.

Please submit information to following two entities:

Federal Minor NSR Permit Coordinator
U.S. EPA, Region 8
1595 Wynkoop Street, 8P-AR
Denver, CO 80202-1129
R8airpermitting@epa.gov

For more information, visit:
<http://www.epa.gov/caa-permitting/tribal-nsr-permitting-region-8>

The Tribal Environmental Contact for the specific reservation:

**Three Affiliated Tribes Environmental Division
404 Frontage Road
New Town, ND 58763**

A. GENERAL SOURCE INFORMATION

1. (a) Company Name (Who owns this facility?) Van Hook Gathering Services, LLC	2. Facility Name FBIR Compressor Station		
(b) Operator Name (Is the company that operates this facility different than the company that owns this facility? What is the name of the company?) MCP Operating LLC			
3. Type of Operation Natural Gas Compressor Station	4. Portable Source? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No 5. Temporary Source? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
6. NAICS Code 213112	7. SIC Code 1389		
8. Physical Address (Or, home base for portable sources) N/A			
9. Reservation* Fort Berthold	10. County* Mountrail	11a. Latitude (decimal format)* 47.841273	11b. Longitude (decimal format)* -102.580244
12a. Quarter Quarter Section* SENE	12b. Section* 4	12c. Township* 150 North	12d. Range* 93 West

*Provide all proposed locations of operation for portable sources

B. PREVIOUS PERMIT ACTIONS (Provide information in this format for each permit that has been issued to this source. Provide as an attachment if additional space is necessary)

Facility Name on the Permit
Permit Number (xx-xxx-xxxxx-xxxx.xx)
Date of the Permit Action

Facility Name on the Permit
Permit Number (xx-xxx-xxxxx-xxxx.xx)
Date of the Permit Action

Facility Name on the Permit
Permit Number (xx-xxx-xxxxx-xxxx.xx)
Date of the Permit Action

Facility Name on the Permit
Permit Number (xx-xxx-xxxxx-xxxx.xx)
Date of the Permit Action

Facility Name on the Permit
Permit Number (xx-xxx-xxxxx-xxxx.xx)
Date of the Permit Action

C. CONTACT INFORMATION

Company Contact (Who is the <u>primary</u> contact for the company that owns this facility?) Michael Faulk		Title EHS&C Coordinator
Mailing Address 1221 Lamar, Suite 1950, Houston, Texas 77010		
Email Address Michael.Faulk@mcpoperating.com		
Telephone Number (337) 569-2286, x89009	Facsimile Number (337) 569-2217	
Operator Contact (Is the company that operates this facility different than the company that owns this facility? Who is the <u>primary</u> contact for the company that operates this facility?) Nathan Griffith		Title Operations Manager
Mailing Address 4918 Gulf Beach Highway Cameron, LA 70631		
Email Address Nathan.Griffith@mcpoperating.com		
Telephone Number (337) 422-2037	Facsimile Number (337) 569-2217	
Permitting Contact (Who is the person <u>primarily</u> responsible for Clean Air Act permitting for the company? We are seeking one main contact for the company. Please do not list consultants.) Michael Faulk		Title EHS&C Coordinator
Mailing Address 4918 Gulf Beach Highway Cameron, LA 70631		
Email Address Michael.Faulk@mcpoperating.com		
Telephone Number (337) 569-2286, x89009	Facsimile Number (337) 569-2217	
Compliance Contact (Is the person responsible for Clean Air Act compliance for this company different than the person responsible for Clean Air Act permitting? Who is the person <u>primarily</u> responsible for Clean Air Act compliance for the company? We are seeking one main contact for the company. Please do not list consultants.) Michael Faulk		Title EHS&C Coordinator
Mailing Address 4918 Gulf Beach Highway Cameron, LA 70631		
Email Address Michael.Faulk@mcpoperating.com		
Telephone Number (337) 569-2286, x89009	Facsimile Number (337) 569-2217	

D. ATTACHMENTS

Include all of the following information (see the attached instructions)

*Please do not send Part 71 Operating Permit Application Forms in lieu of the check list below.

- FORM SYNMIN** - New Source Review Synthetic Minor Limit Request Form, if synthetic minor limits are being requested.
- Narrative description of the proposed production processes. This description should follow the flow of the process flow diagram to be submitted with this application.
- Process flow chart identifying all proposed processing, combustion, handling, storage, and emission control equipment.
- A list and descriptions of all proposed emission units and air pollution-generating activities.
- Type and quantity of fuels, including sulfur content of fuels, proposed to be used on a daily, annual and maximum hourly basis.
- Type and quantity of raw materials used or final product produced proposed to be used on a daily, annual and maximum hourly basis.
- Proposed operating schedule, including number of hours per day, number of days per week and number of weeks per year.
- A list and description of all proposed emission controls, control efficiencies, emission limits, and monitoring for each emission unit and air pollution generating activity.
- Criteria Pollutant Emissions** - Estimates of Current Actual Emissions, Current Allowable Emissions, Post-Change Uncontrolled Emissions, and Post-Change Allowable Emissions for the following air pollutants: particulate matter, PM₁₀, PM_{2.5}, sulfur oxides (SO_x), nitrogen oxides (NO_x), carbon monoxide (CO), volatile organic compound (VOC), lead (Pb) and lead compounds, fluorides (gaseous and particulate), sulfuric acid mist (H₂SO₄), hydrogen sulfide (H₂S), total reduced sulfur (TRS) and reduced sulfur compounds, including all calculations for the estimates.

These estimates are to be made for each emission unit, emission generating activity, and the project/source in total. Note, there are no insignificant emission units or activities in this permitting program, only exempted units and activities. Please see the regulation for a list of exempted units and activities.

- Air Quality Review**
- ESA (Endangered Species Act)**
- NHPA (National Historic Preservation Act)**

E. TABLE OF ESTIMATED EMISSIONS

The following tables provide the total emissions in tons/year for all pollutants from the calculations required in Section D of this form, as appropriate for the use specified at the top of the form.

E(i) – Proposed New Source

Pollutant	Potential Emissions (tpy)	Proposed Allowable Emissions (tpy)	
PM	46.61	3.36	PM - Particulate Matter
PM ₁₀	46.61	3.36	PM ₁₀ - Particulate Matter less than 10 microns in size
PM _{2.5}	46.61	3.36	PM _{2.5} - Particulate Matter less than 2.5 microns in size
SO ₂	0.07	0.07	SO ₂ - Sulfur Dioxide
NO _x	488.14	93.39	NO _x - Nitrogen Oxides
CO	2,246.70	98.79	CO - Carbon Monoxide
VOC	2,023.63	97.98	VOC - Volatile Organic Compound
Pb	0	0	Pb - Lead and lead compounds
Fluorides	0	0	Fluorides - Gaseous and particulates
H ₂ SO ₄	0	0	H ₂ SO ₄ - Sulfuric Acid Mist
H ₂ S	7.56E-04	7.56E-04	H ₂ S - Hydrogen Sulfide
TRS	0	0	TRS - Total Reduced Sulfur
RSC	0	0	RSC - Reduced Sulfur Compounds

Emissions calculations must include fugitive emissions if the source is one the following listed sources, pursuant to CAA Section 302(j):

- (a) Coal cleaning plants (with thermal dryers);
- (b) Kraft pulp mills;
- (c) Portland cement plants;
- (d) Primary zinc smelters;
- (e) Iron and steel mills;
- (f) Primary aluminum ore reduction plants;
- (g) Primary copper smelters;
- (h) Municipal incinerators capable of charging more than 250 tons of refuse per day;
- (i) Hydrofluoric, sulfuric, or nitric acid plants;
- (j) Petroleum refineries;
- (k) Lime plants;
- (l) Phosphate rock processing plants;
- (m) Coke oven batteries;
- (n) Sulfur recovery plants;
- (o) Carbon black plants (furnace process);
- (p) Primary lead smelters;
- (q) Fuel conversion plants;
- (r) Sintering plants;
- (s) Secondary metal production plants;
- (t) Chemical process plants
- (u) Fossil-fuel boilers (or combination thereof) totaling more than 250 million British thermal units per hour heat input;
- (v) Petroleum storage and transfer units with a total storage capacity exceeding 300,000 barrels;
- (w) Taconite ore processing plants;
- (x) Glass fiber processing plants;
- (y) Charcoal production plants;
- (z) Fossil fuel-fired steam electric plants of more than 250 million British thermal units per hour heat input, and
- (aa) Any other stationary source category which, as of August 7, 1980, is being regulated under section 111 or 112 of the Act.

E(ii) – Proposed New Construction at an Existing Source or Modification of an Existing Source

Pollutant	Current Actual Emissions (tpy)	Current Allowable Emissions (tpy)	Post-Change Potential Emissions (tpy)	Post-Change Allowable Emissions (tpy)
PM				
PM ₁₀				
PM _{2.5}				
SO ₂				
NO _x				
CO				
VOC				
Pb				
Fluorides				
H ₂ SO ₄				
H ₂ S				
TRS				
RSC				

PM - Particulate Matter

PM₁₀ - Particulate Matter less than 10 microns in size

PM_{2.5} - Particulate Matter less than 2.5 microns in size

SO₂ – Sulfur Dioxide

NO_x - Nitrogen Oxides

CO - Carbon Monoxide

VOC - Volatile Organic Compound

Pb - Lead and lead compounds

Fluorides - Gaseous and particulates

H₂SO₄ - Sulfuric Acid Mist

H₂S - Hydrogen Sulfide

TRS - Total Reduced Sulfur

RSC - Reduced Sulfur Compounds

[Disclaimers] The public reporting and recordkeeping burden for this collection of information is estimated to average 20 hours per response, unless a modeling analysis is required. If a modeling analysis is required, the public reporting and recordkeeping burden for this collection of information is estimated to average 60 hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
FEDERAL MINOR NEW SOURCE REVIEW PROGRAM IN INDIAN COUNTRY
40 CFR 49.151**

**Application for Synthetic Minor Limit
(Form SYNMIN)**

Use of this information request form is voluntary and not approved by the Office of Management and Budget. The following is a check list of the type of information that Region 8 will use to process information on your proposed project. While submittal of this form is not required, it does offer details on the information we will use to complete your requested approval and providing the information requested may help expedite the process. An application form approved by the Office of Management and Budget can be found online at https://www.epa.gov/sites/production/files/2015-12/documents/synthetic_minor_limit_application_rev2017_0.pdf.

Please submit information to following two entities:

Federal Minor NSR Permit Coordinator
U.S. EPA, Region 8
1595 Wynkoop Street, 8P-AR
Denver, CO 80202-1129
R8airpermitting@epa.gov

For more information, visit:
<http://www.epa.gov/caa-permitting/tribal-nsr-permitting-region-8>

The Tribal Environmental Contact for the specific reservation:

Three Affiliated Tribes Environmental Division
404 Frontage Road
New Town, ND 58763

R8airpermitting@epa.gov

A. GENERAL INFORMATION

Company Name (Who owns this facility?) Van Hook Gathering Company, LLC	Facility Name FBIR Compressor Station
Company Contact (Who is the <u>primary</u> contact for the company that owns this facility?) Michael Faulk	Title EHS&C Coordinator
Mailing Address 1221 Lamar, Suite 1950, Houston, Texas 77010	
Email Address Michael.Faulk@mcpoperating.com	
Telephone Number (337) 569-2286, x89009	Facsimile Number (337) 569-2217

B. ATTACHMENTS

For each criteria air pollutant, hazardous air pollutant and for all emission units and air pollutant-generating activities to be covered by a limitation, include the following:

- Item 1** - The proposed limitation and a description of its effect on current actual, allowable and the potential to emit.
- Item 2** - The proposed testing, monitoring, recordkeeping, and reporting requirements to be used to demonstrate and assure compliance with the proposed limitation.
- Item 3** - A description of estimated efficiency of air pollution control equipment under present or anticipated operating conditions, including documentation of the manufacturer specifications and guarantees.
- Item 4** - Estimates of the Post-Change Allowable Emissions that would result from compliance with the proposed limitation, including all calculations for the estimates.
- Item 5** – Estimates of the potential emissions of Greenhouse Gas (GHG) pollutants.

APPENDIX C LABORATORY ANALYSES

QUESTAR ENERGY SERVICES
 1210 D. Street, Rock Springs, Wyoming 82901 (307) 352-7292

Description	WHITING CDP INLET		
Company	WPX ENERGY		
Field	VAN HOOK	Meter Number	NA
Analysis Date/Time	3/5/18 3:27 PM	G.C. Method	QUESGAS, GPA 2286
Analyst Initials	DEM	Sample Temp.	44
Date Sampled	3/1/2018	Sample Pressure	44
Sampled By	BKS	Cont. Number	1056
Data File	WHITING CDP INLET.gcd	Instrument ID	Shimadzu/GC2014/19cs
Flowrate	NA	Last Calibration	3/5/2018
Sample Point	UPSTREAM OF MTR AT INLET		

Component	Mol%	Wt%	LV%
Methane	53.4610	32.0225	42.7680
Ethane	20.2482	22.7327	25.6269
Propane	13.0570	21.4973	16.9908
Isobutane	1.2329	2.6754	1.9046
n-Butane	3.7912	8.2273	5.6446
Neopentane	0.0062	0.0168	0.0113
Isopentane	0.5556	1.4967	0.9604
n-Pentane	0.7723	2.0805	1.3209
2,2-Dimethylbutane	0.0024	0.0076	0.0047
2,3-Dimethylbutane	0.0316	0.1017	0.0611
2-Methylpentane	0.1275	0.4101	0.2498
3-Methylpentane	0.0768	0.2472	0.1480
n-Hexane	0.1499	0.4822	0.2910
Heptanes	0.2906	1.0318	0.5638
Octanes	0.0269	0.1137	0.0635
Nonanes	0.0081	0.0376	0.0202
Decanes plus	0.0009	0.0048	0.0026
Nitrogen	5.5409	5.7953	2.8688
Carbon Dioxide	0.6200	1.0188	0.4990
Oxygen	ND	ND	ND
Hydrogen Sulfide	ND	ND	ND
Total	100.0000	100.0000	100.0000

Global Properties	Value Units
Gross BTU/Real CF	1491.5 BTU/SCF at 60°F and 14.73 psia
Sat.Gross BTU/Real CF	1467.1 BTU/SCF at 60°F and 14.73 psia
Gas Compressibility (Z)	0.9943
Specific Gravity	0.9268 air=1
Avg Molecular Weight	26.784 gm/mole
Propane GPM	3.578437 gal/MCF
Butane GPM	1.594586 gal/MCF
Gasoline GPM	0.756282 gal/MCF
26# Gasoline GPM	1.949002 gal/MCF
Total GPM	12.066767 gal/MCF
Base Mol%	99.923 %v/v

PAGE #1

Description:

WHITING CDP INLET

PAGE #2

H2SLength of Stain Tube NA ppm

Component	Mol%	Wt%	LV%
Benzene	0.0094	0.0273	0.0124
Toluene	0.0042	0.0145	0.0067
Ethylbenzene	0.0001	0.0004	0.0002
M&P Xylene	0.0013	0.0051	0.0023
O-Xylene	0.0002	0.0008	0.0004
2,2,4-Trimethylpentane	0.0214	0.0912	0.0507
Cyclopentane	0.0010	0.0027	0.0014
Cyclohexane	0.0185	0.0582	0.0298
Methylcyclohexane	0.0212	0.0777	0.0402

GRI GlyCalc Information

Component	Mol%	Wt%	LV%
Carbon Dioxide	0.6200	1.0188	0.4990
Hydrogen Sulfide	ND	ND	ND
Nitrogen	5.5409	5.7953	2.8688
Methane	53.4610	32.0225	42.7680
Ethane	20.2482	22.7327	25.6269
Propane	13.0570	21.4973	16.9908
Isobutane	1.2329	2.6754	1.9046
n-Butane	3.7912	8.2273	5.6446
Isopentane	0.5618	1.5135	0.9717
n-Pentane	0.7723	2.0805	1.3209
Cyclopentane	0.0010	0.0027	0.0014
n-Hexane	0.1499	0.4822	0.2910
Cyclohexane	0.0185	0.0582	0.0298
Other Hexanes	0.2383	0.7666	0.4636
Heptanes	0.2149	0.7602	0.4226
Methylcyclohexane	0.0212	0.0777	0.0402
2,2,4 Trimethylpentane	0.0214	0.0912	0.0507
Benzene	0.0094	0.0273	0.0124
Toluene	0.0042	0.0145	0.0067
Ethylbenzene	0.0001	0.0004	0.0002
Xylenes	0.0015	0.0059	0.0027
C8+ Heavies	0.0343	0.1498	0.0834
Subtotal	100.0000	100.0000	100.0000
Oxygen	ND	ND	ND
Total	100.0000	100.0000	100.0000

APPENDIX D
FLARE AND COMBUSTOR 40 CFR §60.18 SPECIFICATIONS



FLARE SOLUTIONS

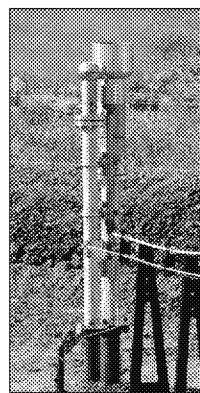
Specifications

Steffes is committed to working with our customers to provide the simplest, most efficient, and most reliable solutions for flaring requirements. Our flares are designed to help operators meet the EPA 40 CFR 560.18 requirements, including our patent pending variable orifice design.

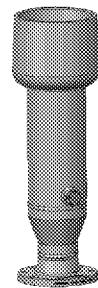
Data is for reference only. Call Steffes Technical support for more specific information.

Flare Tip Model		Technology	Back Pressure*	Rated Flow [†] Measuring Circuits	Max Flow Capacity	Power Required	Pipe Connections	Typical Installations	
High Pressure	Low Pressure							Produced Gas	Tank Gas
High Pressure	SHP-6	Variable Orifice	5.5 - 10 PSI	1.1 MMSCFD	2.2 MMSCFD [‡]	No	4"	X	
	SHC-6		4 - 6 PSI	3.0 MMSCFD	10.0 MMSCFD [‡]	No	4"	X	
Low Pressure	SVG-3B4	Air Assist	3 - 5 OSI	106 MSCFD	750 MSCFD [§]	No	3"		X
	SAA-2		0 - 3 OSI	200 MSCFD	See chart 4	120 v	3"		X
8" High Capacity Series	SAA-4	Air Assist	0 - 1 OSI	600 MSCFD	See chart 5	480 V 3 Phase	4"		X
	8" Dual SHC-6		4-6 PSI	6.0 MMSCFD	20 MMSCFD	No	8"	X	
8"	8" Tri SHC-6	Variable Orifice	4-6 PSI	9.0 MMSCFD	30 MMSCFD	No	8"	X	
	8" Quad SHC-6		4-6 PSI	12.0 MMSCFD	40 MMSCFD	No	8"	X	
Pilot ^{**}	SPL-1	Pilot	8 PSI	264 SCFD	N/A	Spark System Required	3/8" Compression	X or Propane	

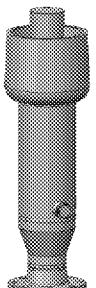
*Measured at flare tip. [†]"Rated Flow" is the flow rate used by independent third parties to confirm Steffes' flare compliance with the prescriptive provisions of 40 CFR 60.18. Gas flow rates that do not exceed these values can be assumed to comply with all relevant EPA flare performance requirements. [‡]"Max Flow Capacity" is the highest flow rate allowed by Steffes for use in each specified flare. Flow rates above the "Max Flow Rate" may void warranties. [§]All low pressure flares can meet requirements of 40 CFR 60.18 if smokeless operation is confirmed by Method 22. Also will need to be evaluated for flame stability, re-light capability, and radiation. ^{**}Pilot can run at 6 - 10 PSI. Flow Rate will vary by pressure and gas composition.



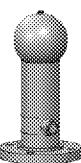
VARIABLE ORIFICE FLARES



SHP-6

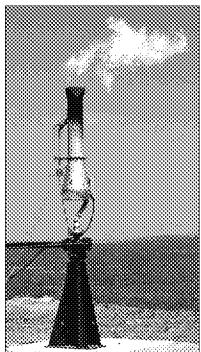


SHC-6



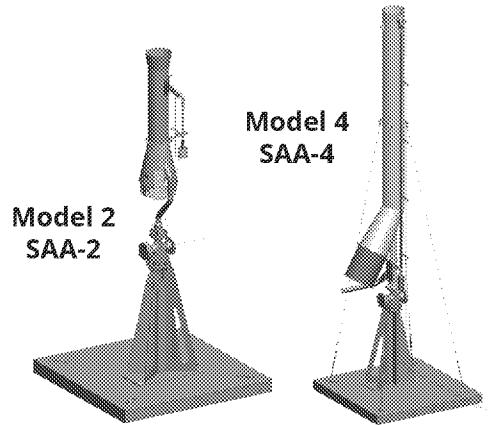
SVG-3B4

The Steffes Variable Orifice Flares give optimum system performance over a wide range of gas flows for both high pressure and low pressure gases. Configure your flare system with singular or multiple flare tips to maximize performance. Models SHP - 6, SHC - 6, SVG - 3D4, and SVG - 3D8.



AIR ASSIST FLARES

The Steffes Air Assist Flares burn low pressure gas over a wide range of flow rates. Low pressure gas is mixed with air from a variable speed fan to provide a clean burn. Model 2 (SAA - 2) and Model 4 (SAA - 4).



VARIABLE ORIFICE FLARES

Modular Design: Three (3) Pieces can be used together or separately

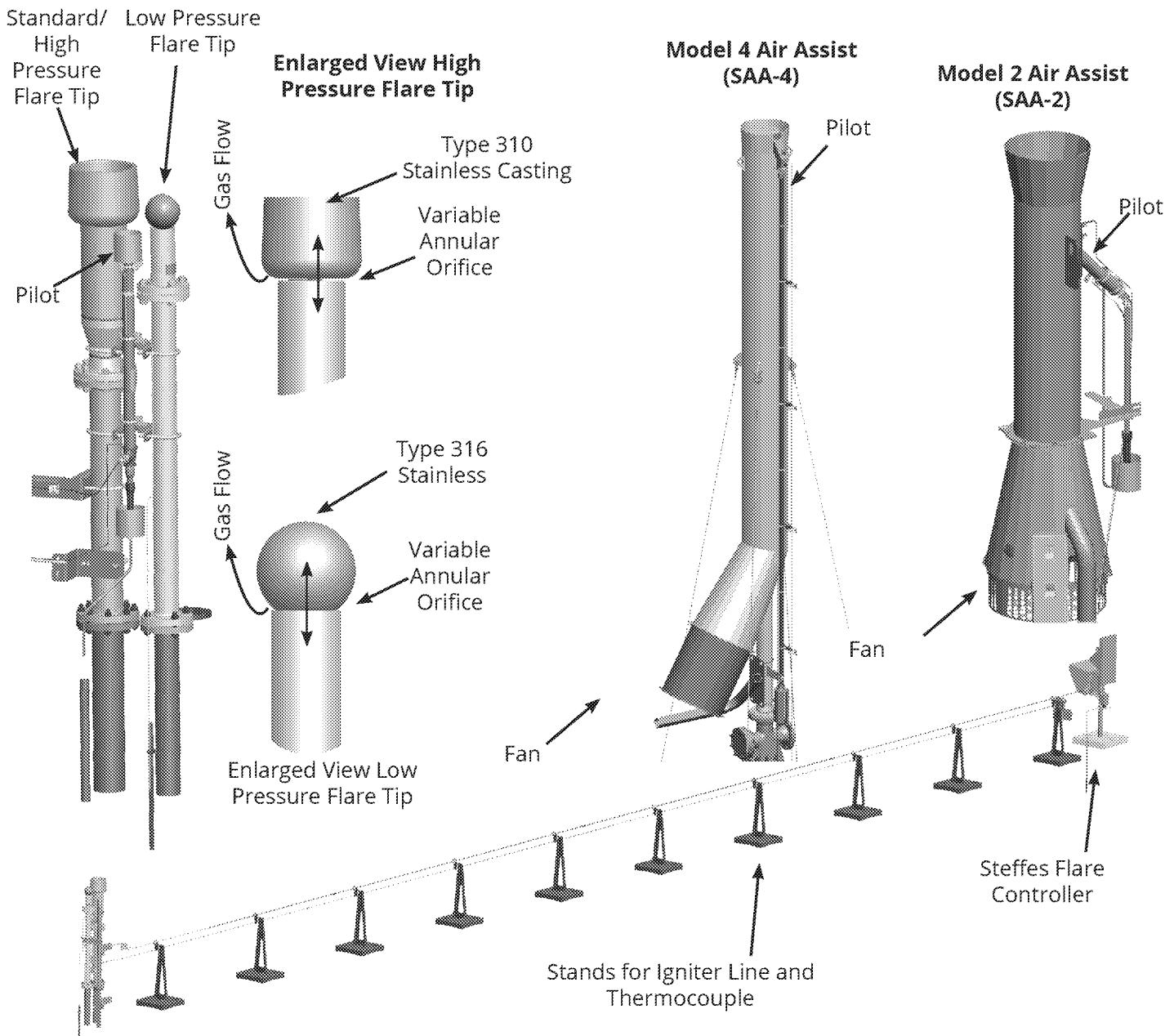
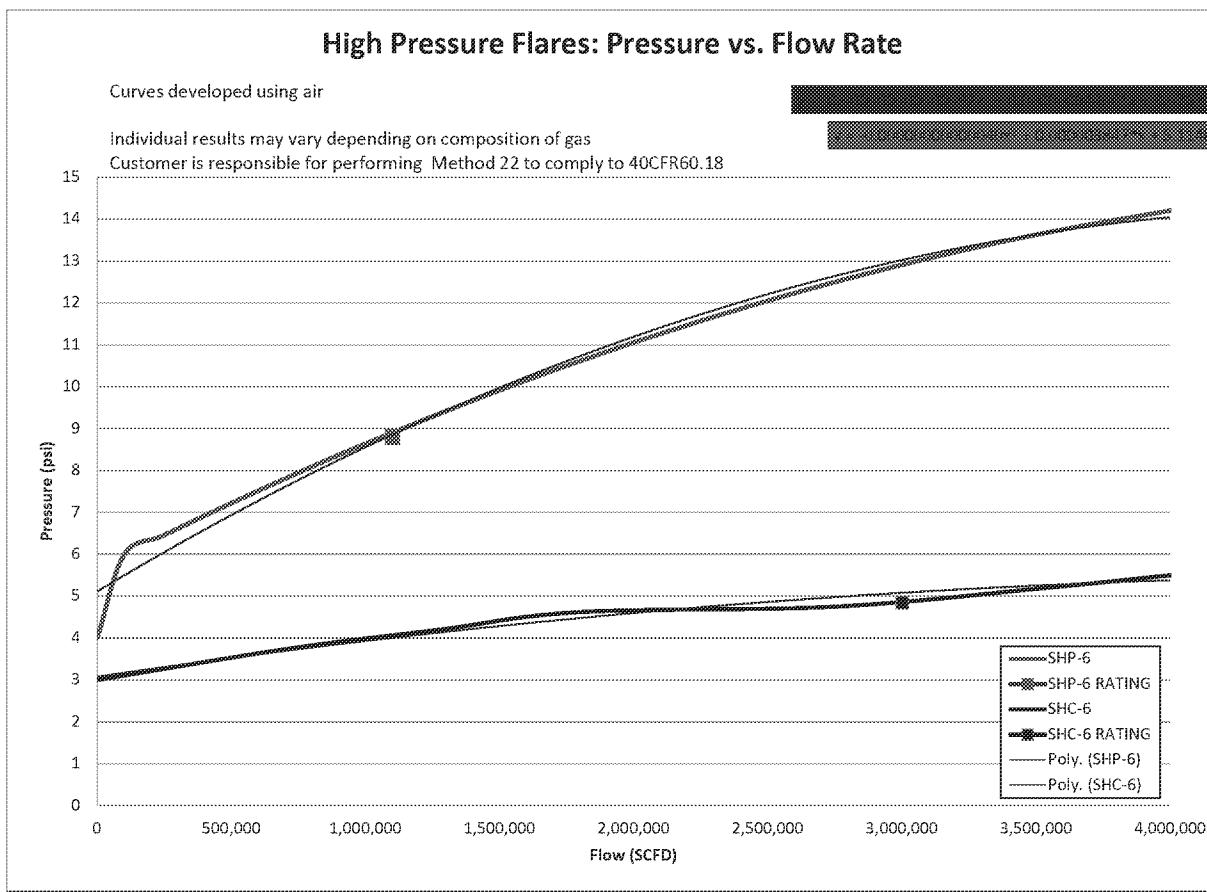


CHART 1



SHP-6

Maximum Rate Tested by 3 rd Party	1.1 MMSCFD
Minimum Rate Tested	0.05 MMSCFD

SHC-6

Maximum Rate Tested by 3 rd Party	3.0 MMSCFD
Minimum Rate Tested	0.05 MMSCFD

GAS CHARACTERISTICS (SEPARATOR GAS) DURING 3RD PARTY TESTING

Specific Gravity at 40 psig and 100F	0.89*
Gross Heating Value	1550* BTU/SCF

*Pressure was measured at the test port on tip during third party testing.

*Data is from third party test report. Flare is designed to operate with 1100 to 2500 BTU/SCF gas. Performance can be affected by specific gas composition.

*Flares are able to handle more flow than the current ratings allow, however "Max Flow Capacity" is the highest flow rate allowed by Steffes for use in each specified flare. Flow rates above the "Max Flow Rate" may void warranties.

*Data is for reference only.

*Smokeless operation is achieved by building pressure in the flare, and the Minimum Rate is defined as typical flow required to begin building pressure in flare barrel. Minimum Rate can be affected by conditions restricting the proper seating of the translating tip and the barrel resulting in lower operating pressures. Flares operating at pressures less than those shown on chart can still meet the requirements of 40 CFR 60.18 if verification of smokeless operation is confirmed by Method 22.

CHART 2

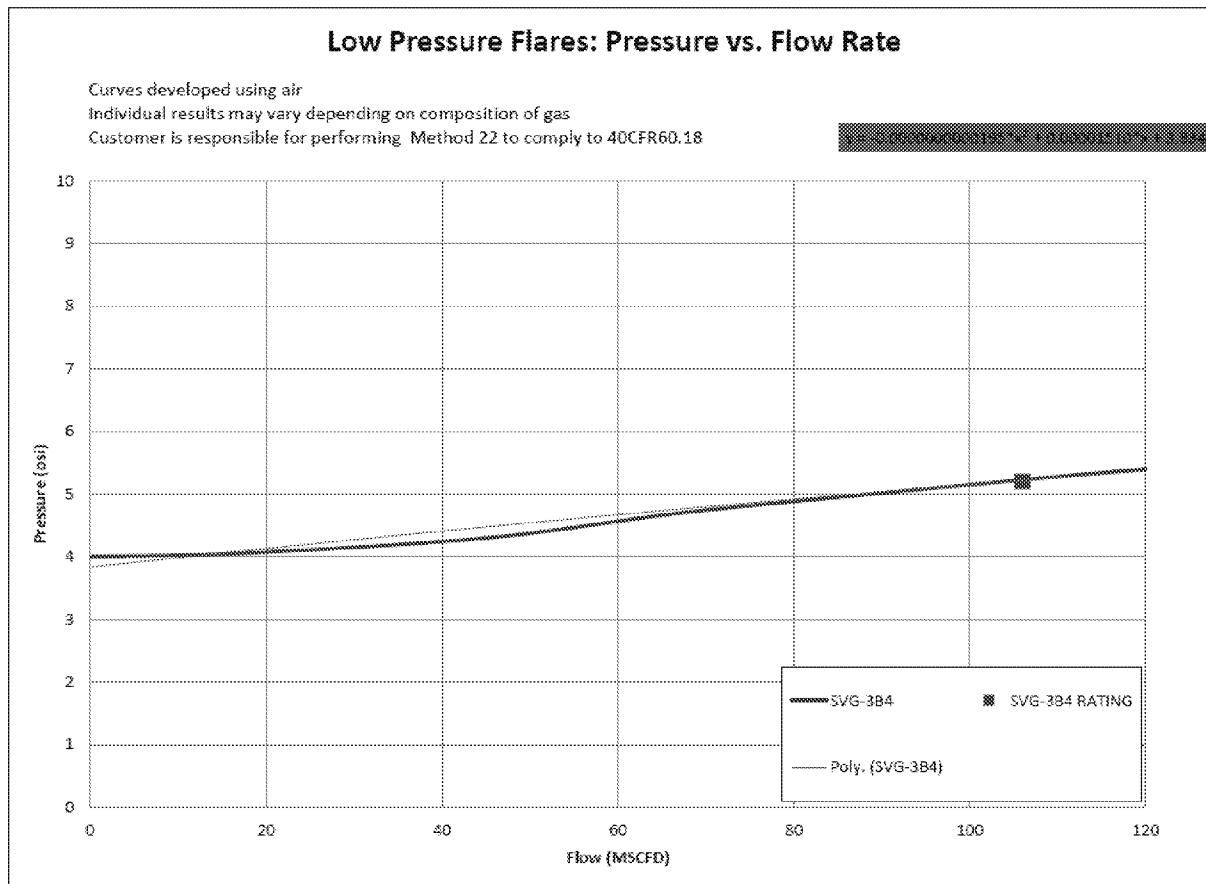


CHART 3

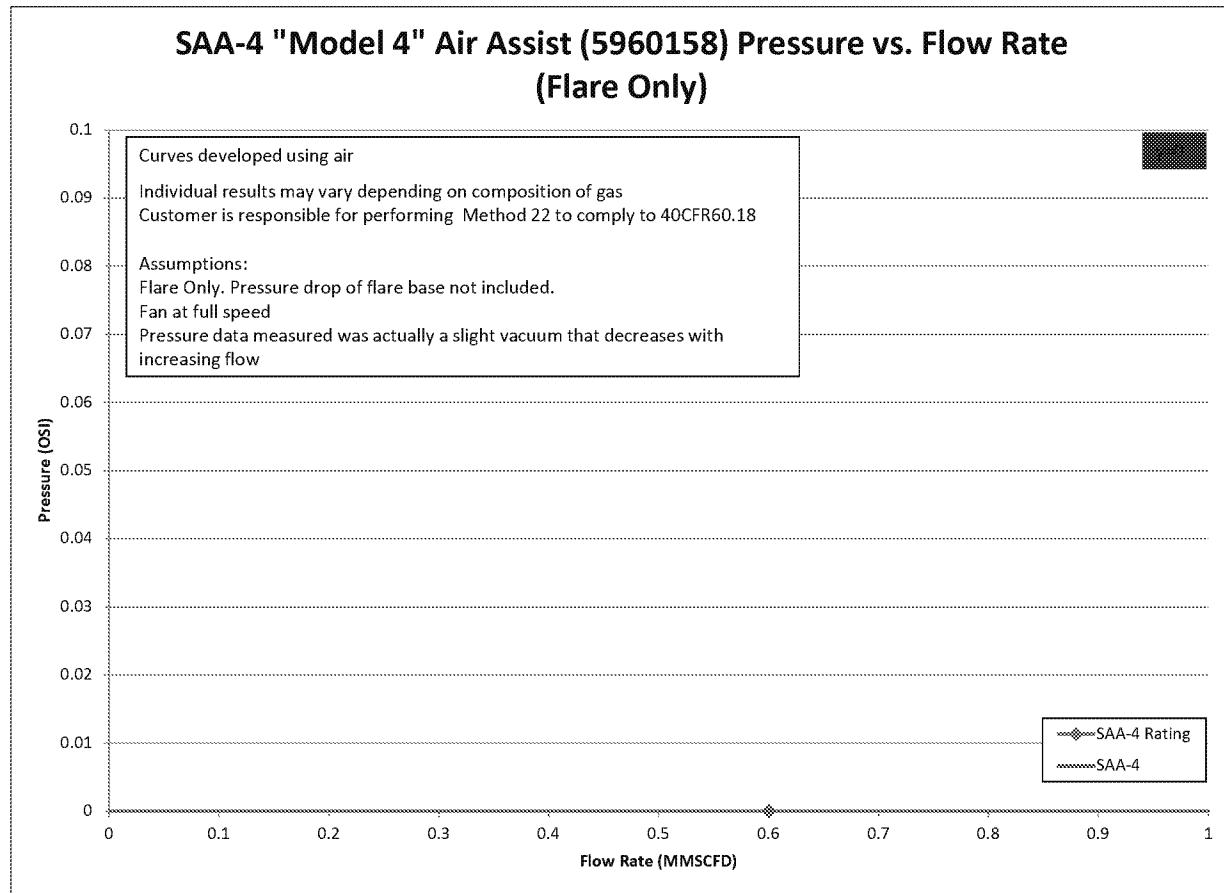


CHART 4

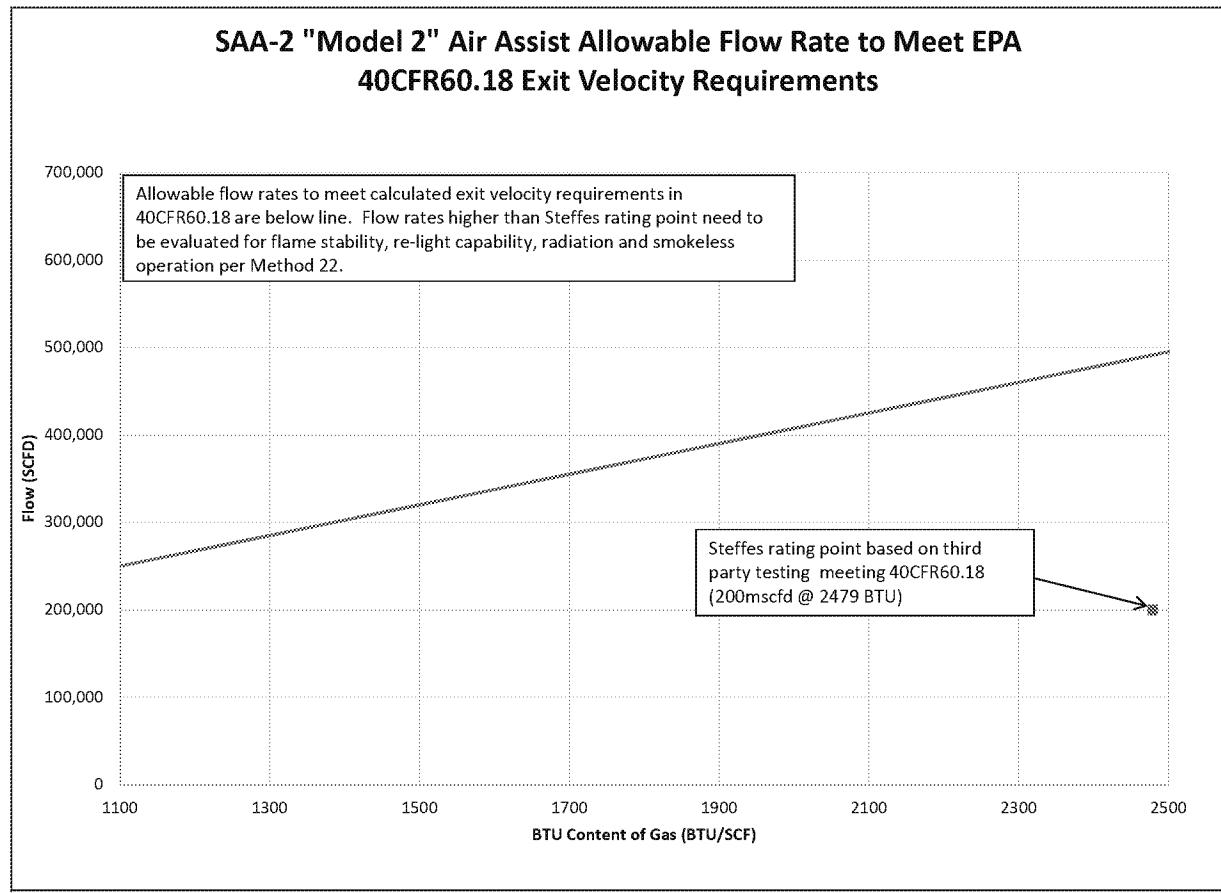
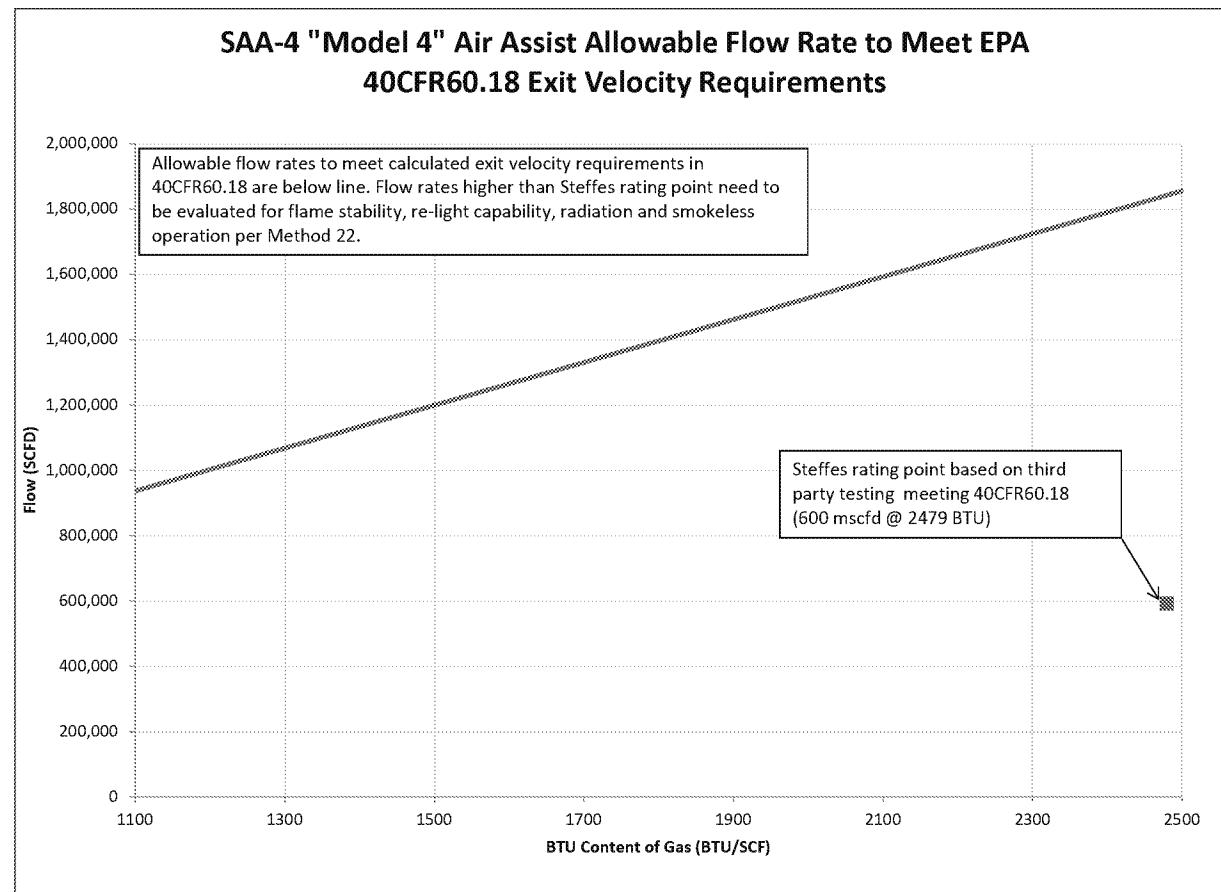


CHART 5



LOW PRESSURE FLARES	Rated Flow	Minimum Flow Rate	Gross Heating Value During Testing
Maximum Rate Tested by 3 rd Party - SVG-3B4	106 MSCFD	18,000 SCFD	1750 BTU/SCF (on-site gas)
Maximum Rate Tested by 3 rd Party - SAA-2	200 MSCFD	0	2479 BTU/SCF (propane)
Maximum Rate Tested by 3 rd Party - SAA-4	600 MSCFD	0	2479 BTU/SCF (propane)

*Low Pressure curves represent testing data done with air as a medium, and pressure was measured at the test port on tip.

*Low Pressure Flares (SVG-3B4, SVG-3D4, and SVG-3D8) meet requirements of 40 CFR 60.18 up to flow rates of 750 mscfd if verification of smokeless operation is confirmed by method 22.

*Flares are designed to operate with 1100 to 2500 BTU/SCF gas. Performance can be affected by specific gas composition.

*Low Pressure curves represent the nominal to max pressure.

*Data is for reference only.

*Smokeless operation is achieved by building pressure in the flare, and the Minimum Rate is defined as typical flow required to begin building pressure in flare barrel. Minimum Rate can be effected by conditions restricting the proper seating of the translating tip and the barrel resulting in lower operating pressures. Flares operating at pressures less than those shown on chart can still meet the requirements of 40 CFR 60.18 if verification of smokeless operation is confirmed by Method 22.

Third Party has also confirmed the presence of a standing pilot flame monitored by a thermocouple on all Steffes flares in compliance with EPA 40 CFR 60.18.

CHART 6

CHART 7

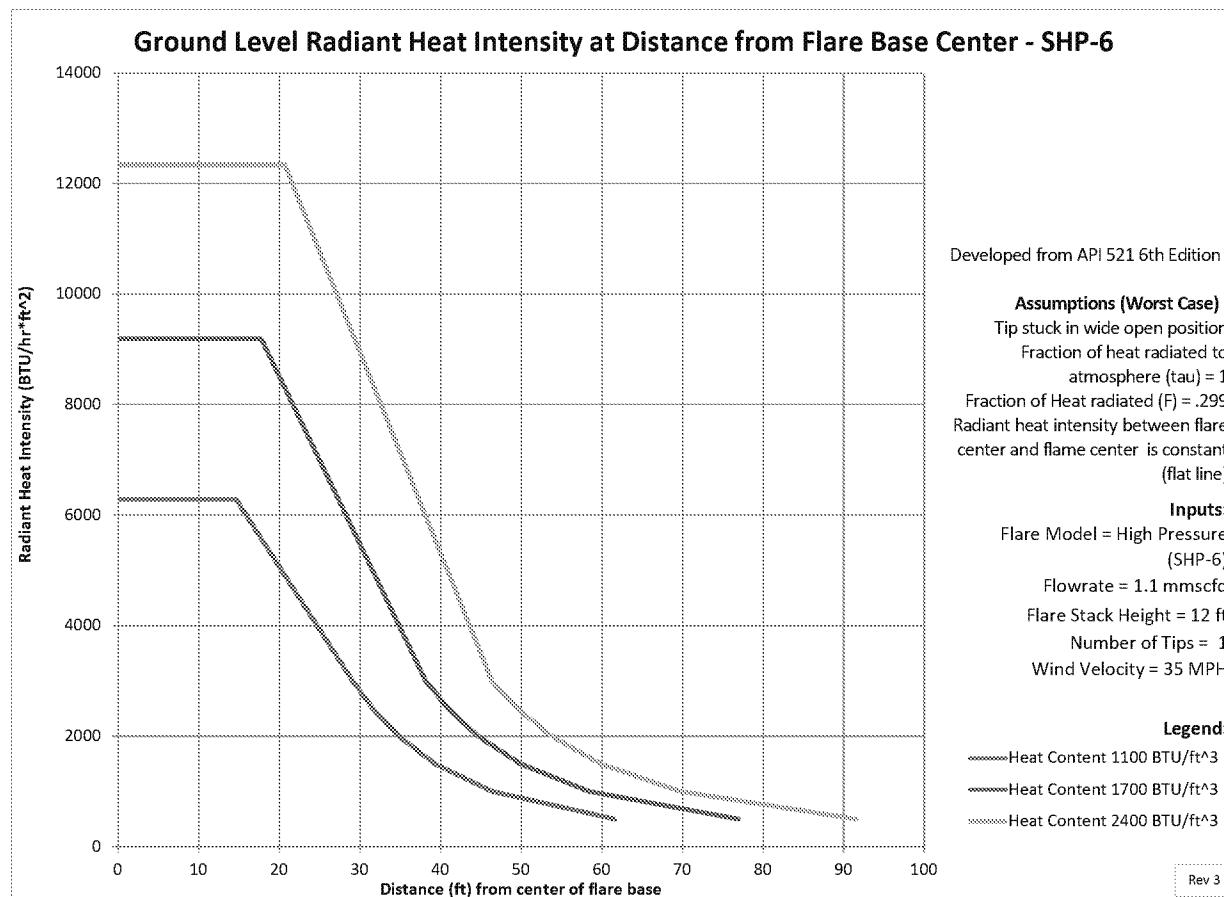


CHART 8

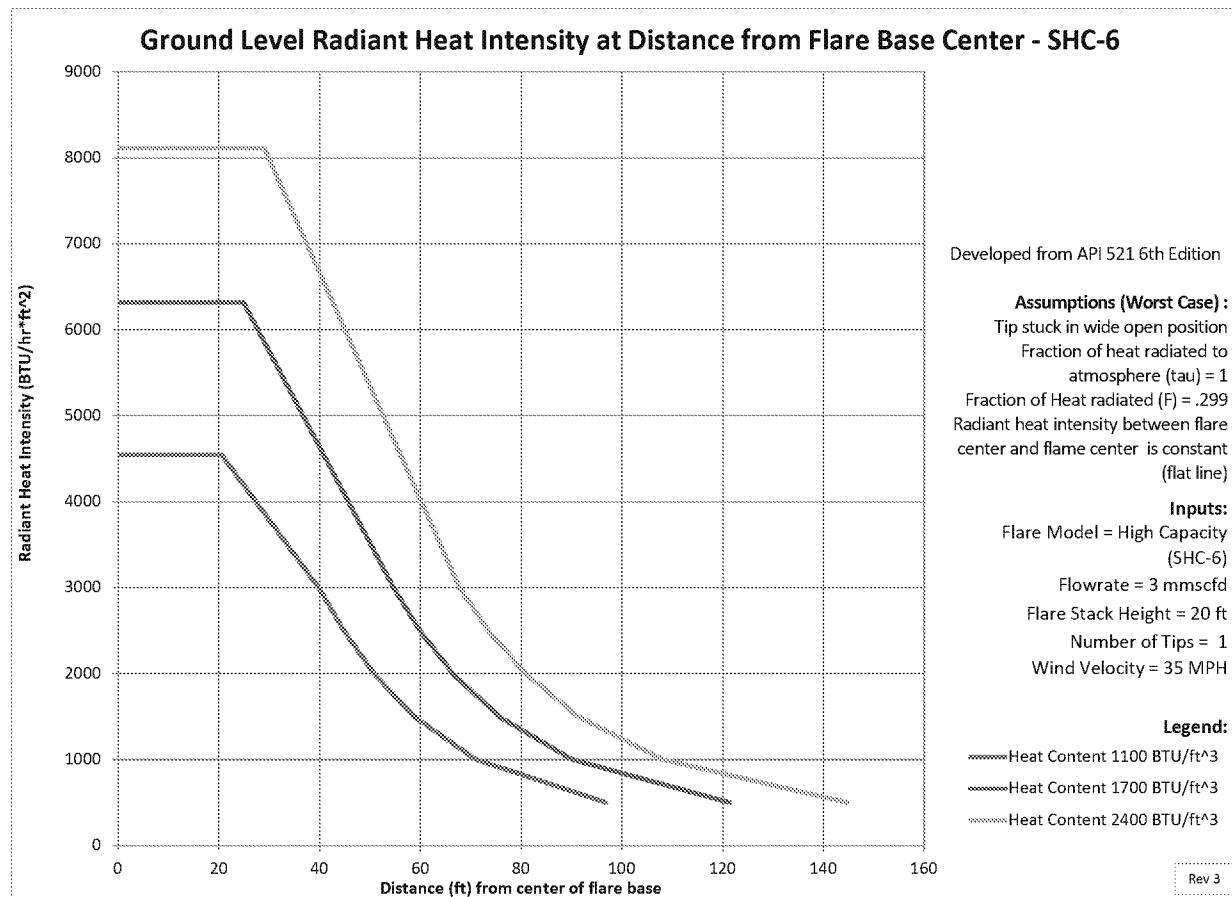


CHART 9

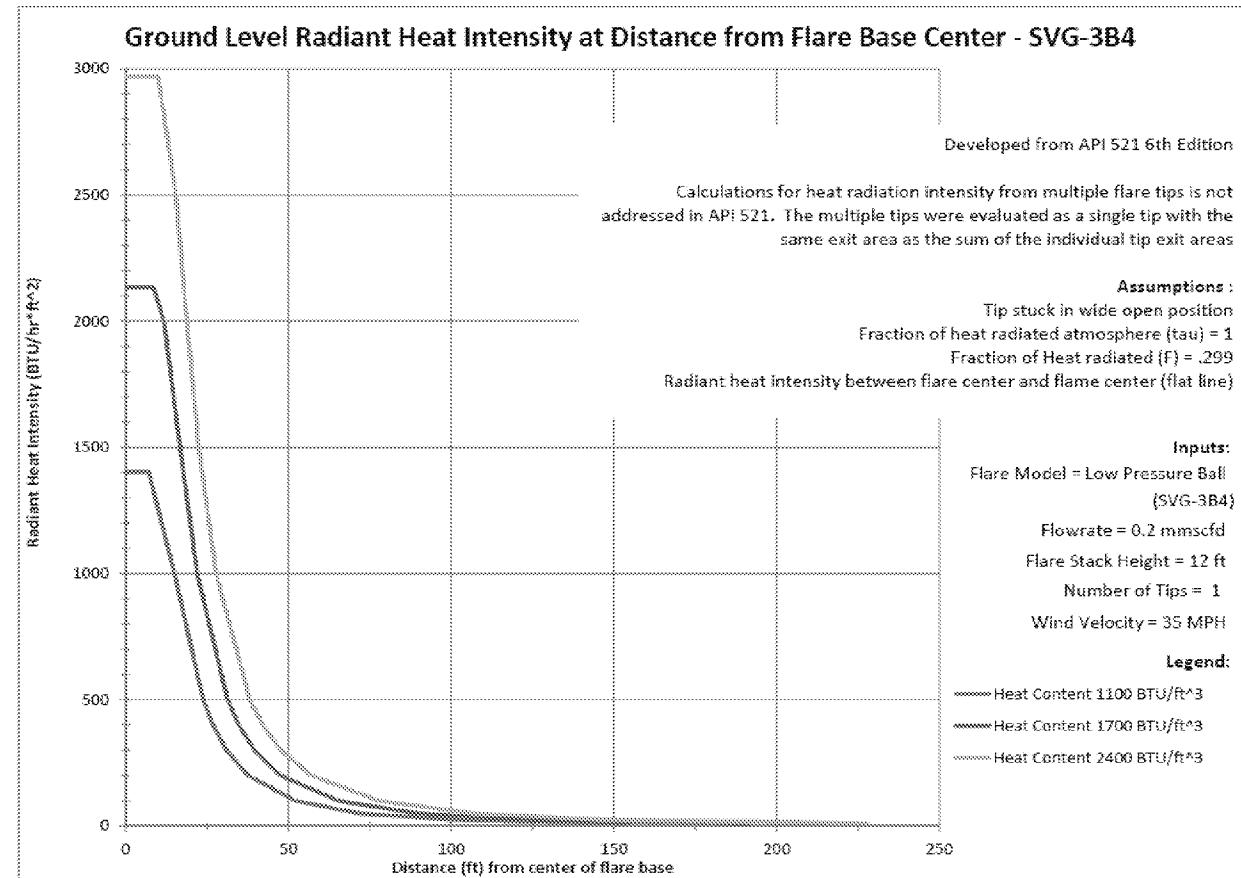


CHART 10

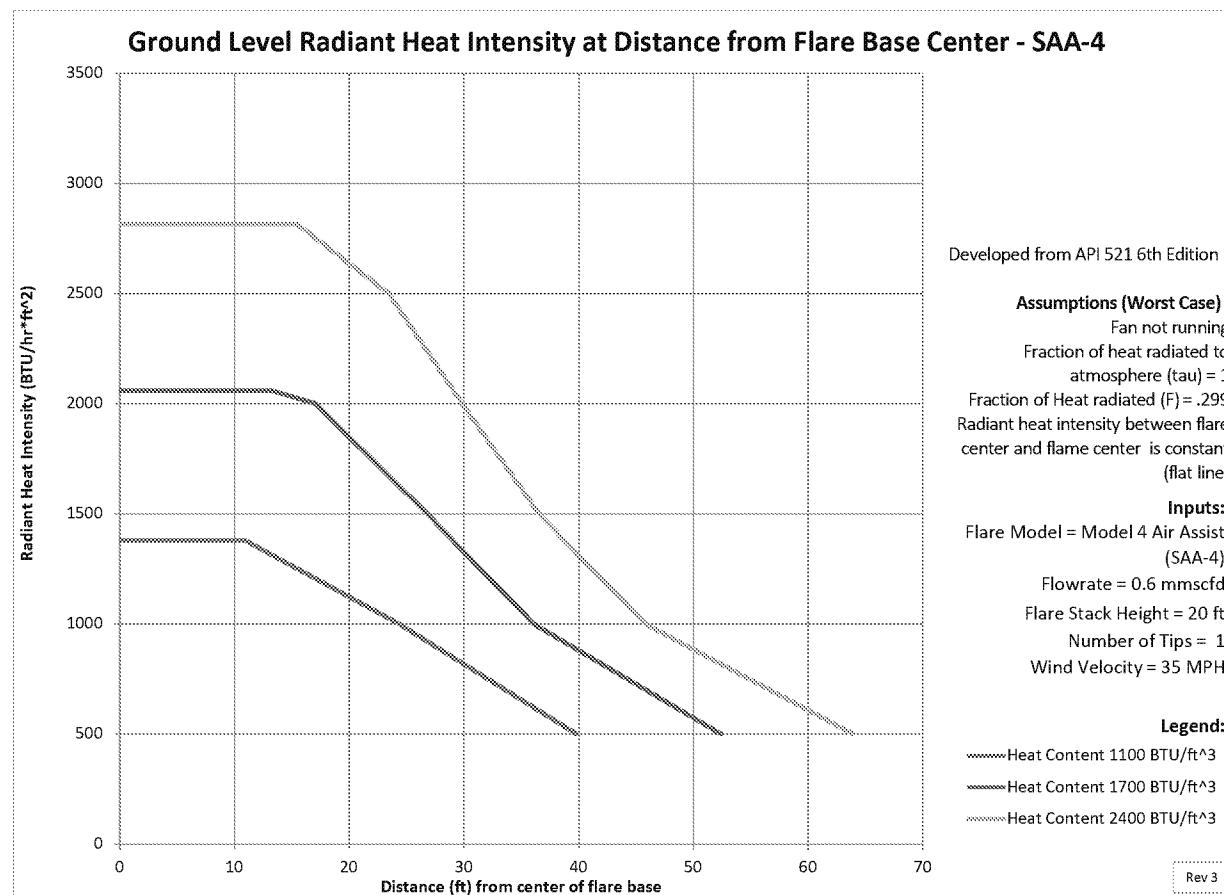
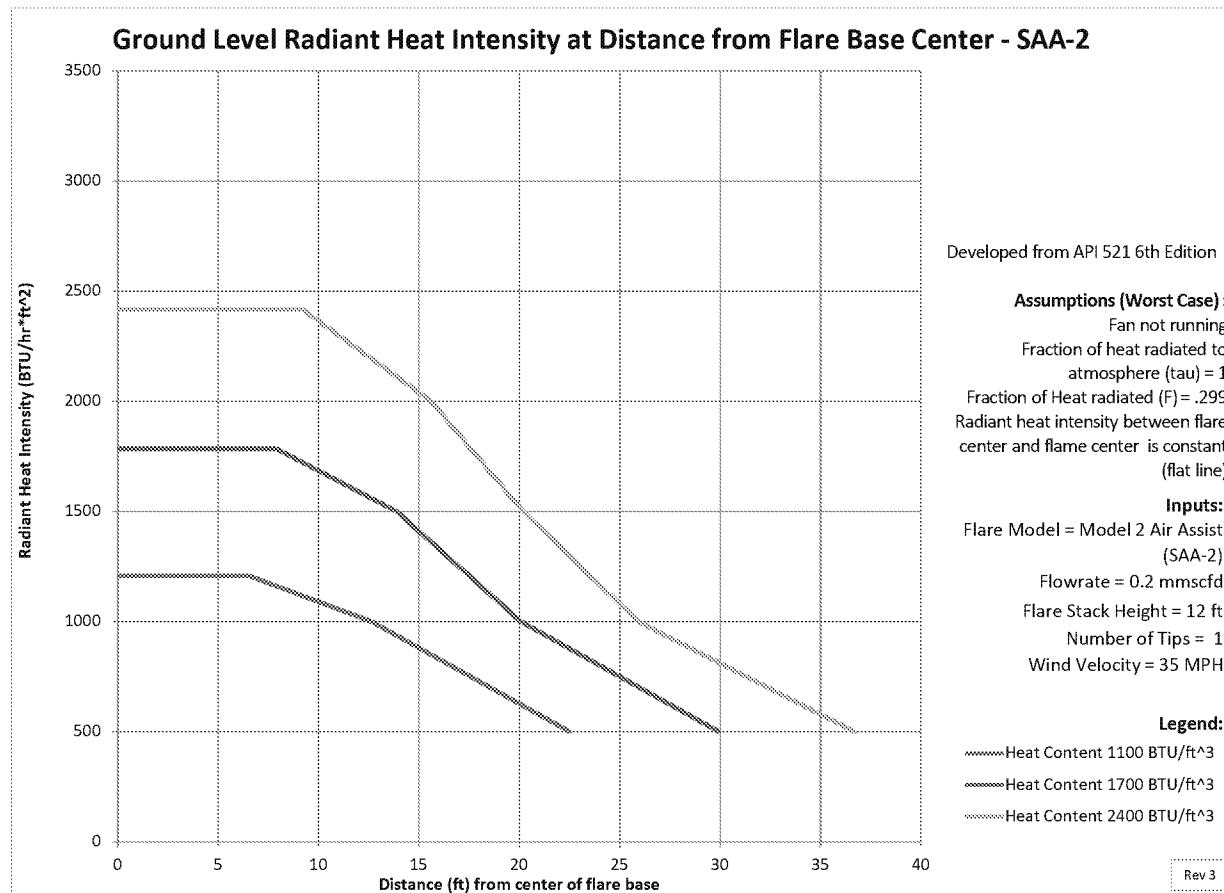


CHART 11

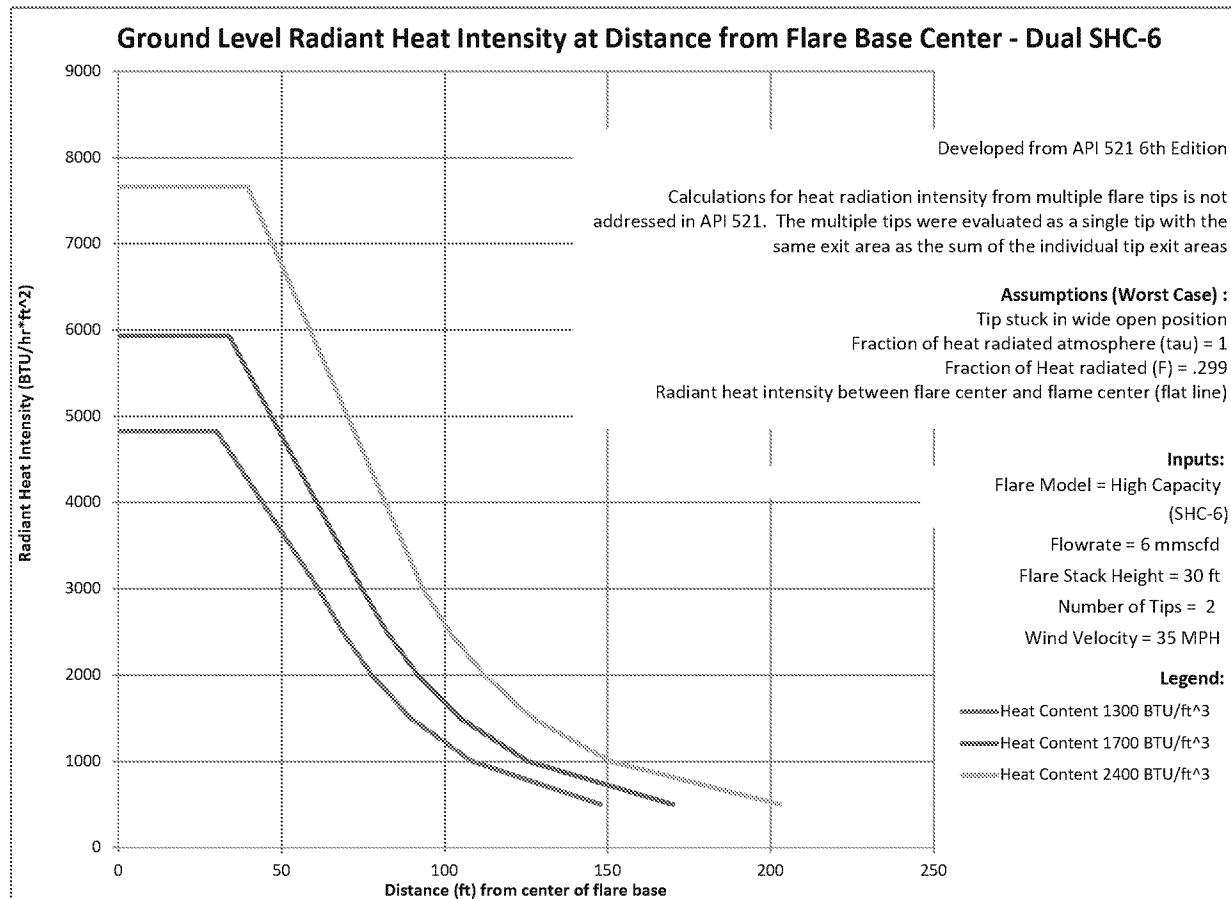


CHART 12

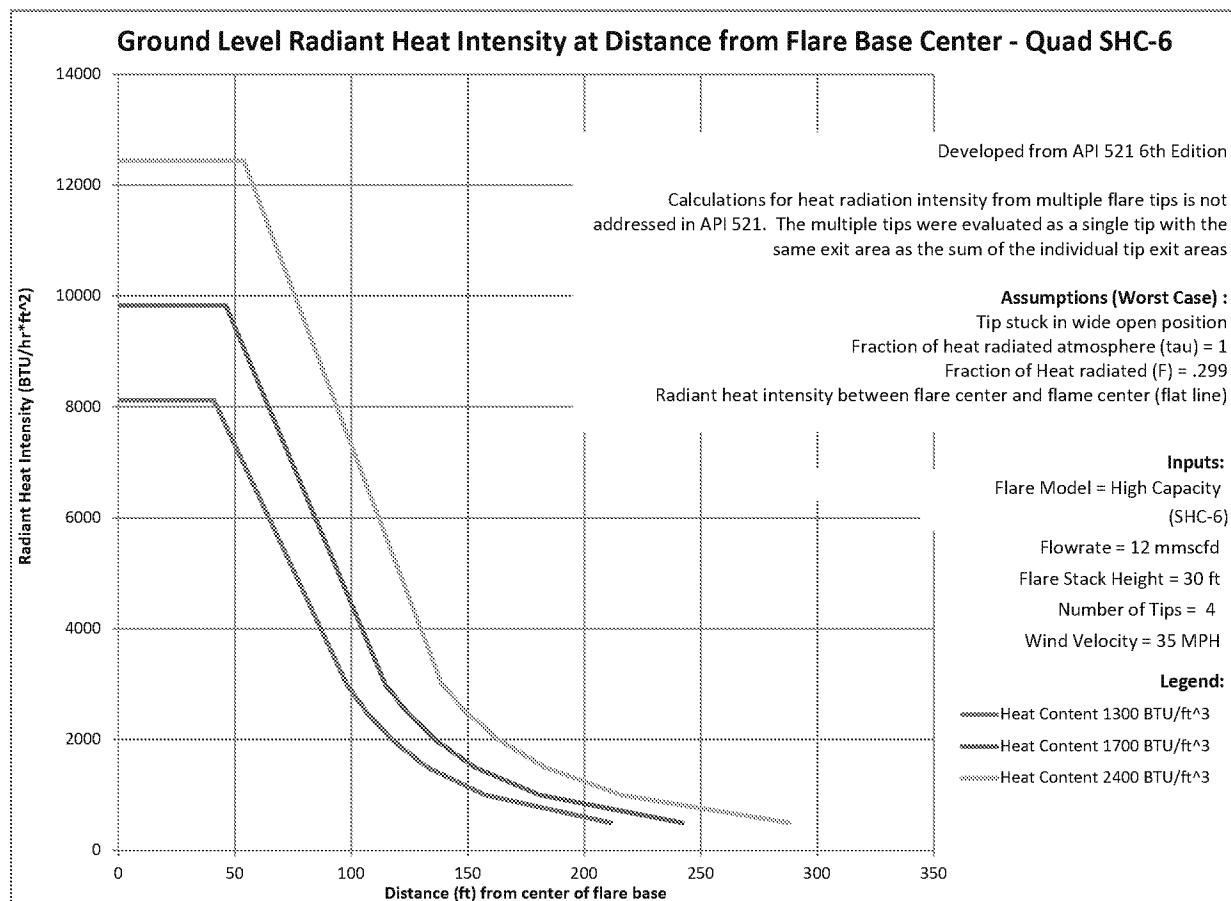
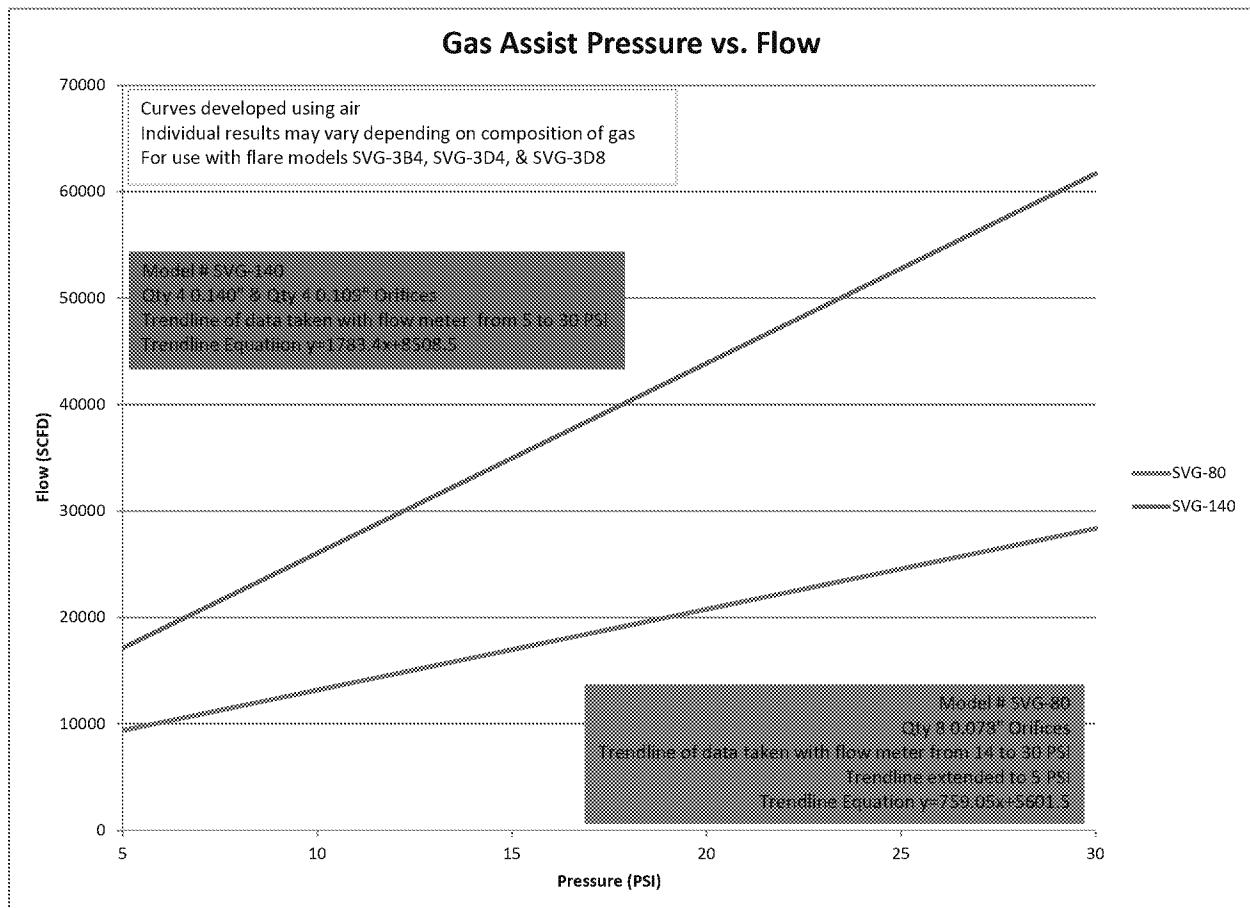


CHART 13



The Gas Assist is used to reduce smoke from low pressure flares, in cases when the BTU of gas is too high, the flow rate is too low or the flow rate is too high. Intended to fit low pressure models of the Variable Orifice Flares: SVG-3B4.

Test data based on propane.

Data is reference only. Call factory for more specifics.

3. EQUIPMENT SUMMARY

3.1 48" SCD

48" SCD

- 6.0 MM BTU/hr Capacity
- Over 99.9% Mass Destruction Rate Efficiency
- 8'-8" tall combustion chamber
- 12'-8" overall height (including skid)
- Multi-jet burner manifold
- 4" thick Full Diameter Flame Arrestor at the bottom air intake
- SCD in insulated with 2" Ceramic insulation
- 4" SCD Inlet connection
- Base section of SCD is welded to skid and the top section is removable
- Bird Screen (removable for maintenance)

12 ¾" OD x 5'-0" x 40psi V. Accumulator/Booster

- Code Vessel per ASME Section VIII, Div. I
- Dual Chamber unit
 - Accumulator (Upper Chamber) is a separator for the liquids to fall out of the gas stream and flow to the lower chamber
 - Booster (Lower Chamber) is a blowcase where the liquids collect until the level is high enough to be dumped
- 4" CL150 Inlet (This is the inlet to the unit)
- 1/16" Corrosion Allowance
- Mechanical High Level Shutdown built-in
- Additional 2" NPT connection for optional High Level Switch
- 1/2" Heat trace connections in both sections (the heat trace is built into the vessel but will have to be connected to a remote source for operation, if needed)
- Sight Glasses in both Accumulator and Booster Sections
- Accumulator/Booster is insulated with 1 ½" Insulation & Aluminum Shielding
- 1" NPT Liquid Out connection w/ check valve

6 5/8" OD x 2'-0" x 125psi V. Fuel Gas Scrubber

- Code Vessel per ASME Section VIII, Div. I
- 1/16" Corrosion Allowance



- Mechanical High Level Shutdown in outlet connection
- 1" NPT Inlet Connection (This is the inlet for the Supply Gas)
- $\frac{1}{2}$ " NPT Drain Connection

Skid

- 4'-4" Wide x 11'-0" Long

Igniter System

- Platinum BMS, No Modbus

In-line Flame Arrestor (on inlet of SCD)

- PROTEGO 2" NPT Stainless Steel In-Line Deflagration Arrestor #FA-G-2in-IIA-P1,5

Utility Requirement

- 100psi dry fuel gas for pilot and blowcase
- The pilot is designed for dry natural gas and the gas consumption is 16.4 SCFH
- Blowcase fuel consumption is dependent on liquid accumulation
- Addition electric power is not needed

Finished Unit

- The SCD packaged unit will come piped and painted with all accessories necessary for operation
- Removable section of the SCD will be painted Hi-Temp Black
- The rest of the unit will be painted Sandstone Tan

Operational Overview

The gas stream will come into the inlet of the Accumulator/Booster where any liquids will fall out. Then the gas will go out through an in-line flame arrestor to the SCD to be burned. The liquids in the upper chamber (Accumulator) will flow into the lower chamber (Booster). When the level control (in the lower chamber) is activated, the lower chamber is pressured up and the liquids are "boosted" into the tanks. There is a check valve between the upper and lower chambers that directs the fluid to the liquid out connection instead of the upper chamber.

